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The Therapeutic Use of Various Qualities of Roentgen and Radium Rays*

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IN developing an x ray technique for superficial and deep therapy, we are inclined to make two errors: (1) Either we may try to treat all superficial lesions with *one* quality of rays; and, to use *one* radiation for all deep therapy conditions. This procedure does enable one to establish and to control treatment conditions very easily; it is simple also to check the kilovoltage filtration, distance, etc. However, it is a schematic procedure, it is uneconomical and in many cases not to the benefit of the patient.

(2) If we try to establish a large series of different treatment conditions for the various diseases to be treated, we may commit the opposite error. It is difficult to find and to control the factors which produce certain biological results. And it might happen, that we combine improper treatment factors, as too high a kilovoltage with too low a filtration.

Therefore, a certain standardization seems advisable. From this standpoint several authors have worked out a method to divide the various lesions or diseases into a few groups, and to treat each group with one quality of rays. Within each group slight variations in the technique may be necessary, concerning the kilovoltage, the filter and the distance, which determine the penetration of the radiation, together with the amount of energy to be applied, either in one dose or in fractional doses. Holzknecht has developed the most elaborate scheme to classify the various diseases and to determine the method of x ray treatment. The superficial diseases for instance are classified by Holzknecht into four groups to each of which a known quality and quantity of rays is applied. Holzknecht's treatment factors, however, vary widely from those employed in the United States. The radiation used for superficial treatment with lowest penetration is produced with an 8 to 10 inch spark gap, filters of ½ to 1 mm. Al., a focus skin distance of 7 to 16 inches. The hardest radiation used for deep seated cancers does not equal the hardest rays employed in deep therapy in this country. Thus the range of rays used in his technique is not very wide; it also appears to be unnecessary to have eight different qualities of rays for the treatment of the various diseases. On the other hand, it seems advisable to extend the range of rays to softest rays for very superficial lesions and to hardest rays for real deep therapy work. To produce the different qualities of rays, that is from very soft to very penetrating ones, at least four different settings are required, and five may even be more preferable.

I. For the radiation treatment of very superficial lesions, a radiation is suggested produced by

100 K V (6″ spark gap),
Unfiltered,
Normal distance 20 cm (8″).

This radiation is especially useful in very extensive lesions, as it does not penetrate the deeper structures of the body and hence does not affect the blood corpuscles. Such a radiation is economical since the treatment time is very short. According to my dosage formula, to be tabulated and explained later, the duration time to apply a mild erythema is computed thus:

$$t_{(\text{Erythema})} = \frac{8^2 \cdot 6}{6^2 \cdot 5} = 2.1\text{—}2 \text{ min., if 5 MA are used}$$

*Read at the Third Annual Meeting of the American College of Radiology and Physiotherapy, Chicago, Nov. 12, 1924.

If very large areas are to be treated, we may use either larger distances up to 40 cm, as used by Holzknecht, or we may employ the method of overlapping the fields, as suggested by Kienboeck and others.

This quality of x rays is indicated in the following skin diseases:

a. Eczema, dermatitis, toxidermia, erythrodermia.

b. Psoriasis, lichen, pityriasis, the various forms of nevus.

c. Leukoplakia, keratoderma, epitheliomata.

d. Pruritus may also be treated with this quality of rays.

II. A second quality of x rays is to be determined that reaches the lower strata of the skin, as the corium, the hair follicles, the matrix of the nails, sweat glands and so forth. These tissues are located at a depth of a few millimeters so that some penetration is required. It is a well known fact, that using a few mm Al. filtration, the margin between a dose which causes defluvium and one that causes an erythema grows larger. This difference in time to produce an epilation and erythema becomes still more pronounced with heavier filtration. However, we should not use too hard a radiation in order to avoid damage of the underlying tissue. In epilating the scalp according to the method of Kienboeck and Adamson five to seven portals are used and a crossfiring of the brain results, which is not desirable, although it may not be dangerous in the adult. When epilating the beard, care has to be taken not to overtreat the region of the larynx. Several instances of very untoward results have been mentioned in the literature. As a proper treatment to produce the desired penetration, effective in the region of the lower strata of the skin, and not dangerous to the deeper tissue, I suggest:

120 K V (8″),
2 mm Al. filtration,
25 cm F. S. D. (10″).

Using 5 M A the treatment time to produce an epilation of the scalp is determined by my formula as follows:

$$t_{(\text{Epil.})} = \frac{10^2 \cdot 12}{8^2 \cdot 5} = 3.8 \backsim 4 \text{ min.}$$

On the other hand, the erythema time is about 6 minutes. With this quality of x rays the following conditions should be treated:

a. Favus, trichophytia, hypertrichosis, sycosis, tinea tonsurans.

b. Acne, acanthosis, verrucae, keratosis, rhinophyma, callositas.

c. Hyperhidrosis.

d. Lupus, scrophuloderma.

e. Some epitheliomata, ulcus rodens.

III. A more penetrating radiation (a third quality) is required, if areas are to be treated that are located in a depth of a few centimeters, and that do not require very large doses. For those conditions the radiation may be produced by

135 K V (9″ spark gap),
4 mm Al.,
35 cm (14″) distance.

Instead of 4 mm Al., 1/10 mm Cu. plus 1 mm Al. may be used, which filters are equivalent in regard to transmission; the hardness secured by the latter is, however, somewhat higher. The erythema time with these factors and 5 M A is:

$$t_{(\text{Erythema})} = \frac{14^2 \cdot 36}{9^2 \cdot 5} = 17 \text{ min.}$$

In most diseases in this group smaller doses suffice. The diseases to be treated with this quality of rays are:

a. Furunculosis, carbuncle.

b. Keloid.

c. Arthritis.

d. Tuberculous sinuses, tuberculous glands.

e. Rhinoscleroma and others.

IV. In the following groups, treatment conditions are considered which are used to treat deep lying diseases, requiring stronger doses. The treatment factors used in the earlier days of deep therapy in this country were as follows:

140 K V, ½ mm Cu. + 1 mm Al., 50 cm (20″) F. S. D.

With 5 M A, in order to produce an erythema, it took:

$$t_{(\text{Erythema})} = \frac{20^2 \cdot 130}{9\frac{1}{2}^2 \cdot 5} = 115 \text{ min.}$$

This time seems to be pretty long; however, at that time it was the only way to secure a radiation with a depth dose of about 35 per cent. At the present time transformers are available, which produce a much higher kilovoltage. With these transformers a much more economical production of x rays of the same penetration (35 per cent depth dose) can be obtained by

170 K V (12″ spark gap),
¼ mm Cu. + 1 mm Al.,
50 cm F. S. D.

Both the higher kilovoltage and the lower filtration reduce the treatment time. In regard to penetration, both factors, higher kilovoltage and lower filtration balance each other, only rendering the radiation somewhat less homogeneous. The treatment time (5 M A) can be figured as follows:

$$t_{(\text{Erythema})} = \frac{20^2 \cdot 69}{12^2 \cdot 5} = 39 - 40 \text{ min.}$$

This radiation can be used to treat areas in a depth of a few centimeters with one portal, and deep seated lesions by crossfire, if very large doses are not required. The indications for this quality of x rays are:

a. Lymphosarcoma, Hodgkin's disease, leukemia, pseudoleukemia.

b. Tuberculosis of the joints, bones and pelvis.

c. Myomata and uterine hemorrhages.

d. Some carcinomata of the breast.

e. Hypertrophy of prostate.

f. Thymus, pituitary, spleen, etc.

This quality of rays is very useful from two important standpoints:

1. The patient stands a treatment of 40 minutes much better than one of 100 or 120 minutes. My experience is that patients become very sick, if treatments are extended much over one hour.

2. The 200 K V tube has a much longer tube life, if part of the treatment is done with lower kilovoltage than with 200 K V. In particular it is advisable to use this radiation to season new tubes before they are operated with 200 K V.

V. In order to apply heavy doses to the deeper regions of the body, as high a penetration is required as can be produced. The higher the penetration, the smaller can be the surface dose and the smaller can be the number of portals and size of each portal of entry.

Several means have been tried to make radiation very penetrating:

1. The kilovoltage has been increased over 200 K V; but this cannot be done without sacrifice of tubes with most of the commercial transformers. It is exceptional for tubes to stand 210 to 220 K V.

2. The filter has been increased to 1 mm Cu. and even to 2 to 3 mm Cu. This is, of course, very uneconomical, as the treatment time must be extended manyfold, and the increase in the depth dose amounts to a few per cent only.

3. Also the F. S. D. has been increased to 70 cm or 1 m, which also is an unnecessary procedure not commensurate with the slight gain in penetration obtained. The most practical method to produce a deep therapy radiation is attained with the following factors:

200 K V (14″ gap),
¾ mm Cu. + 1 mm Al.,
50 cm (20″) F. S. D.

With these conditions and 5 M A the treatment time to produce an erythema dose is calculated as:

$$t_{(\text{Erythema})} = \frac{20^2 \cdot 250}{14^2 \cdot 5} = 102 - 100 \text{ min.}$$

This time is very long, although with many commercial transformers it takes even a longer time to apply an erythema dose. With the water cooled tube this time can be reduced considerably. Having had some experience with this tube, I may state that if the installation is properly done the intensity increases practically with the ratio of the milliamperage; the time to produce the same energy, therefore, is to be shortened in the opposite ratio. It is doubtful, whether with the same energy applied, the biological effect is the same. As far as we can see at the present time, the difference cannot be very large if it exists at all.

This deep therapy radiation may be used *if*

1. it is required to concentrate a very strong dose on a limited area; Holfelder suggested the method in treating carcinoma of the stomach, oesophagus, liver and rectum;

2. a large area must be treated homogeneously with a dose of medium intensity. This may be indicated in the treatment of cancer of the uterus, the cervix in particular, the breast, if the glands of the axilla and the neck are involved, and in many other cases of widely extended carcinomata. Sarcomata should be treated with this quality of rays, because they require large doses to be benefited and because the surrounding tissue must also be treated to prevent metastases.

With the five qualities of rays given above the radiologist is enabled to treat the various diseases. It may even be allowed to reduce these five qualities to four by replacing both, the quality two and quality three, by a new one, determined by 125 K V, 3 mm Al., 30 or 40 cm F. S. D. It is doubtful, however, whether this radiation is not too penetrating for the epilation of large or even convex surfaces and not enough penetrating for the treatment of glandular diseases.

The scale of the four or five qualities of rays represents the technical and physical basis of the treatment work. The primary settings to produce the various kilovolts should be known. Treatment cones or other devices should be used to determine the proper focus skin distance. The epilation or erythema time should not only be determined indirectly by the use of a formula, but also by actual measurements of the intensity of the produced radiation, and it should be controlled by the actual biological results.

The various groups of diseases given above, however, cannot be considered as a standard for treatment work. They must be considered only as examples. Even a single disease may require a different technique according to the clinical conditions. For instance, an epithelioma of the basal cell type may require the quality one especially in its early stage. However, in a later stage, when it has advanced deeper into the tissues, quality two must be used. A prickle cell epithelioma of the lips which infiltrates the whole lip must be treated with quality three. At the same time it requires in addition a deep therapy treatment over the regional lymph glands with the quality four or five. Other lesions, for instance acne, may be treated first by unfiltrated rays, quality one, and if a few pustules remain, they should be treated with slightly harder rays, that is quality two.

It may be of interest to compare the penetrating qualities of radium with those of the various kinds of x radiation given above:

1. Our investigations and measurements have shown that a radium capsule, filtered with 1.5 mm brass to absorb practically all beta rays and applied at a distance of 2.5 cm, delivers the same distribution of energy within the tissue as quality one of x rays described. In both instances the half value layer of the radiation is 1 cm and the depth dose is about 3 per cent. Therefore, radium applications made with a light filter or a shorter distance, or *both*, correspond to an x radiation very much softer and less penetrating than the radiation included in this paper.

2. To attain the penetrating power of the higher qualities of x rays with radium, large plaques of radium capsules must be applied at distances of 6 to 10 cm. Even with these factors, the distribution of energy reaches only that attained with qualities two and three. According to Gaylord and Stenstroem, a plaque of radium emanation seeds of a size of 6.5 by 7 cms and filtered with 2 mm brass and 2 mm rubber and applied at a focus skin distance of 20 cm to a portal of 25 by 25 cm square, gives a depth dose of approximately 35 per cent. That means, that this radiation corresponds to quality four of the x ray scale. For practical purposes, however, this radiation cannot be proposed, as it would require immense quantities of radium to produce any biological effect.

3. This comparison of radium and x radiation proves that both scales overlap in part only. Radium exceeds the x rays if a local reaction is desired with very soft rays. The x rays are superior if large areas should be exposed to a very penetrating radiation.

THIS IS THE DOSAGE FORMULA MENTIONED EARLIER IN THE ARTICLE

$$t = \frac{\text{Focus—Skin—Distance}^2 \text{ (inches)} \times K}{\text{Spark Gap}^2 \text{ (inches)} \times \text{Milliamperage}}$$

K IS GIVEN IN THE FOLLOWING CHART

K V	Filter	Size	K		
Spark Gap	Mm Al. Mm Cu.	Port of Entry	Epilation	Mild Erythema	Profound Erythema
6-10 inches	0	About 5 cm	5	6	12
" "	1	Diameter	9	11	22
" "	2	" "	12	18	36
" "	3	" "	19	27	52
" "	4 1/10	" "	25	36	72
" "	5	" "	32	46	92
" "	6	" "	40	57	110
140 to 200 K V	¼	20 by 20 cm²	45	69	125
" "	½	" "	91	130	225
" "	¾	" "	133	190	310
" "	1	" "	175	250	400

The facts discussed in this paper may be summarized in the following chart:

Quality	X RAYS				RADIUM				INDICATIONS
	K V Sp. Gp.	mm Filter	F. S. D.	Erythema Time	Applicator	mm Filter	F. S. D.	Depth Dose	
———	———	———	———	———	Surface Plaque, Needle Capsule	0 .3 Alloy —1.5 Brass	0	0	a. Eczema, dermatitis, toxidermia. b. Psoriasis, lichen, pityriasis. c. Nevus, angiomas. d. Leukoplakia, keratoderma, epithelioma. e. Pruritus, etc.
1)	100 K V 6″	0	20 cm	2 Min	Capsule	1.5 Brass	2.5 cm	3%	a. Favus, trichophytia, hypotrichosis, sycosis, tinea. b. Acne, acanthosis, verruca, keratoma, rhinophyma, callositas. c. Hyperhidrosis. d. Lupus, scrophuloderma. e. Some epitheliomata, ulcus rodens.
2)	120 K V 8″	2 Al.	25 cm	6 Min	Plaque	2 Brass	6–10 cm	5-10%	a. Furunculosis, carbuncles. b. Keloid. c. Arthritis. d. Tuberculous sinuses, glands, etc. e. Rhinoscleroma, etc.
3)	135 K V 9″	4 Al. or 1 10 Cu. + 1 Al.	35 cm	17 Min					
4)	170 K V 12″	¼ Cu. + 1 Al.	50 cm	40 Min	Plaque 50 cm²	2 Brass	20 cm	35%	a. Lymphosarcoma, Hodgkin's disease, leukemia, pseudoleukemia. b. Tuberculosis of joints, bone, pelvis. c. Myomata and uterine hemorrhages. d. Some carcinomata of the breast. e. Hypertrophy of the prostate. f. Thymus, pituitary, spleen, etc.
5)	200 K V 14″	¾ Cu. + 1 Al.	50 cm	100 Min	———	———	———	40%	a. Carcinomata of the pelvis, etc. b. Sarcomata.

DISCUSSION

Dr. E. W. Carr (Lyons, N. Y.): I just wanted to thank the Doctor for clearing up very many cloudy spots for me; he also made one mention on one condition and if is it not out of order here, I would like a little more light on prostatic hypertrophy.

Dr. M. M. Pomeranz (New York): I have had some experience in hypertrophy of prostate in diseases both in private practice and in hospitals in New York City. While we occasionally have a failure, on the whole our results are very good. At the hospital we have a rather large radiotherapy department. Our method is to divide up the areas anteriorly and posteriorly, dividing two posteriorly on either side of the body, three anteriorly somewhat in the nature of the fibroids and the perineal exposure. The patient is treated once a week. One area only is treated once a week so that at the end of about six weeks every area has been covered and the treatment is stopped for the time being.

If he complains of pain, the question of urination, and so on, becomes a very important one. We give an indirect rectal application of fifty milligrams of radium from four to five hours with proper filter any time during the time the other treatment is being given. Those cases will not go much over two months. Of course, the regular genito-urinary treatment has to be persistent with medical treatment to relieve the pain.

We give 5 milliamperes, 10 inch distance, 5 to 6 minutes, or 8 if they are dark individuals, with 3 millimeters of aluminum over each area.

Now if further treatment is necessary, you can start giving the regular rotation over again within a week or two, because area number one was treated approximately six weeks ago.

If you follow that technique I am pretty certain you will get some surprising results. We have several reprints on the subject that you may have, if you so desire.

Dr. Albert Bachem: In regard to the prostate, x ray crossfire is very advisable through the symphysis and perineum. If you use quality four, I think the distribution is a proper one and we do not need any radium application from the rectum. I think it is advisable to give the treatment in intervals of from one to two weeks.

Ultra Violet Energy in Office Practice*

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THE spectrum of visible sunlight is composed of violet, blue, indigo, green, yellow, orange and red rays. Ultra violet is visible and lies between visible light and the x rays. Only the rays absorbed are effective in producing chemical and physiological changes. The dissociation of carbon dioxide by the green leaf is due to the sun's ultra violet light and not to its heat.

Sunlight should be used whenever possible because of its great good. In its absence, quartz mercury vapor lamps intelligently used will satisfactorily take the place of sunlight. A direct current of electricity is passed through mercury vapor in an exhausted quartz tube which emits approximately 52 per cent heat, 20 per cent visible light, and 28 per cent ultra violet light. The visible spectrum emitted begins at 6,300 Angstrom units, (one ten millionth of a millimeter), which is between orange and yellow rays, and ends slightly beyond the violet, at 3,800 Angstrom units, where invisible ultra violet begins and ends at 1,850 Angstrom units. Lamps should be burned at least seven minutes before using. Fifteen minutes burning is required to produce the shortest wave lengths. Ultraviolet energy in the presence of chlorophyl or the green coloring matter of plants builds up formaldehyde, which later is built up to carbohydrates. A similar building up of proteins occurs.

Dr. Katherine Coward shows that vitamin A is present in the part of flowers which contain carotene. Sir William Baylis suggests that it is carotene rather than chlorophyl which produces vitamins in the presence of ultra violet energy, carotene acting as a sensitizer for ultra violet energy.

It is the ultra violet energy in the presence of chlorophyl, carbon dioxide, and the elements of the earth which builds up the vegetable kingdom. The animal kingdom derives its food from the vegetable kingdom directly by eating the carbohydrates and proteins found in the vegetable kingdom, or indirectly by carniverous animals living on herbiverous animals. Man lives on both the animal and vegetable kingdoms. Man owes to ultra violet energy his coal, gasoline, oil, wood, the clothing he wears, even his own life, because we now know that certain vitamins in our diet control conception. Depriving two generations of this birth-controlling vitamin produces sterility. It is carotene or chlorophyl plus ultra violet energy that builds up vitamins. Hess has shown that the milk of cows fed on pasture in the sunlight maintains the growth and health of young animals, whereas the milk of cows fed in shadow and on vitamin free fodder will not maintain life. Not only does ultra violet energy produce the vitamins in the milk but it also increases the percentage of calcium and phosphorus. The citric acid content of milk is increased over 50 per cent.

Since ultra violet energy controls to a large extent the chemistry of the cow's milk, it seems logical to deduce that it will similarly control the chemistry of human milk. Believing this to be so, I prescribe for both mother and baby biological ultra violet energy when there is a nutritional disturbance present in the child. Clinical results attest to the wisdom of treating both mother and babe in this manner.

Hess has shown that ultra violet energy controls the chemistry of the blood. It increases the amount of iodine in the blood which explains the decreased number of goiters in the summer, and the increased number in the winter. It also produces substances in the blood which are protective against certain poisons.

Ultra violet energy is not only a necessary factor in the creation of the vegetable and animal kingdoms, but it is also the great disinfectant of nature, purifying to a large measure the air we breathe and the water we drink. It is mainly responsible for increasing man's immunity against disease. Moore succeeded in creating life by the use of colloidal uranium, carbon dioxide, water, and ultra violet energy. Unicellular organisms are stimulated to certain physiologic changes, such as fission, or may be destroyed by ultra violet energy, depending on factors such as the intensity of the irradiation, the depth penetration of the wave length employed, and the size of the organism.

It is rational to believe that an energy which will do these things can be used by physicians

*Read at the X Ray, Radium and Physiotherapy Meeting, Omaha, Jan. 5, 1925.

to prevent, relieve, and cure disease.

By means of ultra violet miscroscopy cromaffin structures are shown to absorb ultra violet energy most readily. Pacini puts this into practical use by imagining two cells, 80 microns in diameter with centrally placed nuclei. A ray of biotic ultra violet striking the cell at right angles will penetrate to and be absorbed by the nucleus, stimulating it and increasing the metabolism of the cell, while a short or abiotic ultra violet ray, only capable of penetrating two microns, will be absorbed by the cell wall, coagulating it, thus killing the cell because osmosis no longer can take place.

When activated by ultra violet energy, the skin may act as an organ of internal secretion, producing hormones which may be absorbed and stimulate other organs. Pacini's explanation seems more rational. He calls attention to the fact that the parasympathetic or inhibitor portion of the involuntary nervous system has no superficial end organs and cannot be directly stimulated by ultra violet energy, while the sympathetic or stimulatory portion of the involuntary nervous system sends branches to the skin which are also in relation with all of the internal glandular organs. He says that stimulating the chromaffin tissue of the sympathetic nervous system as found in the skin end organs with ultra violet energy reflexly stimulates the internal glandular organs, and thus regulates metabolism.

In passing through the seventy or more microns of cellular tissue, near ultra violet energy meets blood and lymph. The chemical changes resulting are not well understood. Repeated general bodily irradiations increase the absorption of ultra violet energy probably accounting for the increased immunity against all disease which clinically follows quartz light therapy. Ultra violet energy apparently increases the oxygen carrying capacity of hemoglobin.

Soret, Kober, Harris and Hoyt have shown that the two amino acids, tyrosine and phenylanalin, absorb ultra violet energy readily. The wave lengths not absorbed by them are relatively nontoxic for protoplasm, which means that the toxic, or abiotic region, lies between the limits of 2800 and 2400 Angstrom units. Body cells are singularly deficient in tyrosine and phenylanalin, while bacteria are relatively rich in these two amino acids; hence it is evident how one energy, ultra violet, falling upon a tissue cell and bacterial cell will cause a regenerative and life sustaining effect in the first and, at the same time, destroy the second. Ultra violet energy is bactericidal, not cytocidal, in small doses.

Precisely how light produces chemical change is unknown, but it is clear that only those rays which are absorbed can be effective.

Living tissues and ferments may, by the presence of fluorescent substance, be sensitized. The two best known fluorescent substances are the characteristic coloring materials of the plant and animal kingdoms, chlorophyl and hemoglobin. It appears as if the ability which plants have of forming carbohydrates from carbon dioxide and water is due to the photodynamic action of the fluorescent chlorophyl. We can form carbohydrates from water and carbon dioxide in the laboratory by the use of ultra violet energy.

Going from the research laboratory to the bedside the physician's attention is most often arrested by the problem of tuberculosis.

The medical profession has focused its attention on the tubercle bacillus to the neglect of the individual's resistance. Infection only infects the infectible. Will the germ consume the individual or the individual consume the germ? The nutrition of the individual is the important thing. Everybody is exposed to infection; consequently every one should build up their resistance so that the infection will be conquered. Quartz light therapy and food, rich in vitamins originally produced by ultra violet energy, will increase resistance to withstand successfully the invasion of the tubercle bacilli.

Adequate quartz light therapy prevents tuberculosis. After pulmonary tuberculosis has arisen, quartz light therapy is of value in curing it. The treatment must be guided by the way in which the patient responds to ultra violet therapy. Those patients that tan quickly do best. The ultra violet energy will enable the patient to assimilate from the diet the amounts of calcium, phosphorous, magnesium, iron, iodine, and other elements necessary to nourish the body and overcome disease. To a certain extent it takes the place of food and vitamins.

Ultra violet energy is the best treatment known for surgical tuberculosis. Rollier emphatically states that "surgical tuberculosis" is a misnomer insofar as it involves any suggestion of operative measures as the rational or even the legitimate treatment. Tuberculosis wherever situated is a general disease

presenting local manifestations, and as such, demands treatment directed toward the improvement of the general health. Such local treatment as is necessary must in no way counteract this indispensable disinfection of the body. Correctly understood and applied, heliotherapy fulfills the highest demands of orthopaedic and conservative surgery.

The advantages of a nonoperative method of this kind are many. Mutilations are avoided, articular function is, to a large extent, maintained, the body recovers its harmonious outlines, and the patient returns to the outer world a complete individual, capable of earning his own living. The sluggish vasomotor reflexes of the skin return to normal at equal pace with the pigmentation and so also do the excretory, body temperature regulating, and infection resisting functions of the skin. The disappearance of all tendency to cutaneous infections corresponds fairly closely to the occurrence of pigmentation. Pigmentation is closely associated with resistance of the body against all infections.

An analgesic sense of local warmth at the seat of tuberculous infection occurs with mild reactions. More intense reactions produce tense and uncomfortable joints, while patients with cold abscesses or with lesions of the uterine adnexa may feel rythmical intra-abdominal pulsations synchronous with the pulse.

Tuberculous joints and glands enlarge during the early days of treatment; later they tend to approach normal size. As joints enlarge, function decreases; later with decrease in size, function returns. Fibrous ankylosis may be absorbed and complete return of articular function result. The pain and heat of the tuberculous joints is gradually replaced by a cool sensation. Tuberculous infiltrations are gradually absorbed allowing normal anatomic outlines to be distinguished.

Adequate ultra violet energy treatment of tuberculous spines might obviate the necessity of the Albee bone graft operation. This operation essentially consists of sewing the seeds of bone along a new path, namely connecting the spinal processes together to give an internal brace to the weakened spine, rather than depending upon an external steel brace or plaster cast. The original bone graft always is absorbed. If the operation is successful, a new bony bridge is formed; if sepsis supervenes, amyloid degeneration is prone to occur and the patient usually dies. Quartz light therapy builds powerful back muscles to take the place of the bone inlay; it builds up the nervous system rather than produces shock; it creates new blood, lessens rather than increases the liability to infection, and increases rather than decreases the depth of respiration, as does the body cast applied immediately following the Albee operation.

Tuberculous lymph glands should not be removed surgically, branding the patient by postoperative scars, so that all observers know them as tuberculous. A lymph gland is a natural filter and barrier against infection. On rare occasions with quartz light therapy a tuberculous gland will become so filled with fluid pus that it is advisable to aspirate the excess. This is done by inserting the needle through healthy skin so that a channel will be formed which collapses and seals the gland against secondary infection. The ultra violet cure generally is permanent because the general resistance of the patient against all disease is raised.

The tendency towards hemorrhage in pulmonary tuberculosis is often overcome by judicious quartz light therapy. Tuberculosis whenever found is a general disease, not a local disease, and the general health of the patient must always be improved in order to cure the local condition.

The profession is well agreed that in tuberculosis of a single kidney, surgical removal is indicated, that in tuberculosis of both kidneys, one a mere bag of pus, and the other proving capable of maintaining adequate function, that the removal of the bag of pus is indicated providing the patient can withstand the operative shock.

Tuberculosis of the epididymis and testicle adequately treated with quartz therapy will always give a better end result than the surgical treatment of castration. Castration seldom stops the disease, and unnecessarily asexualizing a man is no more justifiable than unnecessarily asexualizing a woman.

Tuberculosis may destroy the entire eye without producing severe reactions. Tuberculosis being a general disease with local manifestations, biological quartz therapy is indicated. The Finsen Institute has found that tuberculous mucuous membranes respond more readily than tuberculous skin and that the eye can be treated through the closed eyelids. Totally opaque corneas, ulcerations, and hypopyons clear up.

Finsen's curing of lupus vulgaris with the Finsen ray (which is ultra violet energy), centered attention on light therapy. The treatment is prolonged and tedious. The results are the best obtainable. Previous irradiation with x ray or radium apparently lessens the resistance of the tissues to ultra violet. General body irradiations are the most important factor in obtaining permanent cure.

I have rightfully given surgery practically no place in the treatment of tuberculosis. Large extra-articular sequestra which would take too long to dissolve may be removed after the x ray shows healthy surrounding bone. Abscesses under pressure should be aspirated. A resection of the knee may return an individual to work sooner than ultra violet therapy, but it means a permanently short, stiff leg and the tuberculosis often appears in some other portion of the body.

It is wise to remember that "where the sun does not go the doctor goes."

Ultra violet energy is of value in preventing respiratory diseases as well as curing them. A patient coming down with influenza should have a sterilizing nose and throat treatment as well as a general ultra violet irradiation. Diathermy through the chest and general supportive treatment are indicated.

The nose can be sprayed with a 1 to 1000 solution of resorcine or any mild alkaline solution. Two methods of overcoming the nose and throat infection are offered, *i. e.*, small doses of water cooled ultra violet energy often repeated, or large doses at longer intervals. The patient gradually works upward on his nose using the quartz nasal applicator raying each half inch of the nose thirty seconds or so. Both nares are treated. This gives a mild, evenly distributed dose. The small dose could be repeated daily. If the patient cannot take daily treatment, a heavier dose should be administered producing superficial sterilization, as well as a hyperaemia which will last approximately forty-eight to seventy-two hours.

The throat of the influenzal patient is given a water cooled treatment similar to the nasal treatment. I have given hundreds of severe throat reactions and thousands of mild reactions. Severe reactions are painful. In a few cases, the patients become ill. I believe the severe reaction could coagulate superficial albumen, thus sealing up the tonsil and allowing absorption of toxins. Following severe reactions the tonsils shrink and in many cases are apparently sterilized and again function as normal tonsils. I have many patients who were apparently cured of diseased tonsils by a few severe reactions. At present I give small doses, increasing the tone of the tonsil little by little, and at the same time give general bodily irradiations to tone up the entire system. Diet must be regulated as well as the elimination, rest, etc. I think this method, in the majority of cases, is better than tonsil removal. It builds up the entire patient, who in turn restores the diseased tonsil to a condition approaching normal. I also use x ray and electrocoagulation.

X ray and ultra violet irradiations can reach the billions of lymphoid cells scattered throughout the pharynx, while surgery only reaches the lymphoid cells in the tonsils and adenoids.

If the patient coming down with an acute respiratory infection is of the robust type, it is usually possible to abort the disease by giving a second degree reaction over the upper body producing a mustard plaster effect. There is this difference, however, mustard plasters get cold, need to be renewed, and are mussy, while ultra violet reactions last from twenty-four to seventy or more hours, without any of the other objections. Besides its irritant affect, ultra violet has pronounced biological effects. If possible to treat the patient daily, first degree erythemas are indicated; if not, a dose should be administered that will last for several days.

Nothing will aid the convalescent patient like general ultra violet irradiations. The aching associated with prostration is greatly relieved. Ultra violet is a direct analgesic because of its actions on the terminal end organs of the cerebrospinal nervous system.

Ultra violet also aids in breaking down and eliminating toxins.

The ear specialist can prevent practically all cases of otitis media with ultra violet energy and deep therapy heat lamps. A second degree erythema is given to the ear drum, canal, and surrounding tissues, also a nose and throat ultra violet treatment, and a first degree biologic general irradiation. A radiant light is brought close enough to be comfortably hot, the top of the head is kept cool by an ice bag, the body is bared to the waist allowing free evaporation and preventing the depression brought about by long application of heat through clothing. Compressing the

open lens of the water cooled lamp over a painful sinus and producing a second or third degree erythema often gives symptomatic cure of an acute sinusitis. Positive galvanism, and diathermia are useful. Puncture and irrigation of the sinus and resection of the nasal septum may be required.

Water cooled ultra violet energy is of definite use in clearing up nose and throat diphtheria carriers.

Ultra violet energy has a large field of usefulness in surgery. Repeated biological irradiations produce a pigmented skin which is practically infection proof. This is of unique value in operative work on joints, where induced infection generally ruins a joint, often sacrifices a limb or may cause death. Irradiation of the operated wound has a most powerful germicidal effect as well as producing a physiological hyperaemia conducive to rapid healing. Ultra violet tends to rapid healing with very little resultant scar; in fact the writer has removed a large proportion of many operative scars. Blistering doses of ultra violet energy confined to any scar thins it down, layer by layer, resulting in a pliable scar closely approaching normal tissue.

Pain due to inflammation in and about the wound is quickly relieved. Ultra violet produces an inflammation differing from infective or traumatic inflammation since there is no septic, or toxic products, and no venous stasis is present.

Deep seated postoperative pain often is relieved by producing a counterirritant effect over the associated Head zone. Dr. Head mapped out zones on the surface of the body associated with internal viscera, both being supplied by the same spinal segment. Counterirritation of the skin in these zones produces stimulation of the associated visceral segment.

Postoperative nausea and vomiting are relieved by biologic ultra violet because of its anacid effect. The general toning up of the nervous system which follows biologic ultra violet irradiation increases the patient's morale.

The healing of all wounds may be hastened by irradiating with ultra violet. Deep jagged wounds should have all portions treated by flooding them with a photosensitive dye. By means of solid quartz rods, the rays may be led beneath the surface of the dye. It is well to give a dose large enough to produce a second degree erythema in order to kill germs below the surface. Wounds should be treated daily to prevent subsequent infection, relieve pain, stimulate granulation, and insure firm healing with little or no scar.

The nutrition of connective tissue depends on an adequate supply of calcium and phosphorus in the blood. Ultra violet energy acting on the sympathetic nervous system and parathyroid glands governs mineral metabolism. Injuries affecting connective tissue, such as muscle, ligament, tendon, periosteum, bone, etc., are benefited by general ultra violet irradiations. This ensures the necessary chemical composition of the blood best suited for rapid cure. Nature's only method of cure is an adequate supply of good blood to the part. Local ultra violet erythema produces local hyperaemia and general ultra violet irradiations ensure the proper chemical composition of the blood.

Any bone condition in which demineralization is present will be greatly benefited or cured by biologic ultra violet energy. During the period of growth the blood serum contains increased amounts of diffusible calcium and phosphorus necessary for the production of teeth, bone, and connective tissue in general. There is a similar increase following fractures. Clinical experience proves that fractures unite better when the patient has general ultra-violet irradiations. It is not necessary to irradiate the injured part, but if it is kept moderately red with ultra violet energy, pain and swelling will be much less, and functional return will be hastened. Diathermia should be used. Conservative surgery, the free use of photosensitive dyes, water and air cooled ultra violet energy, diathermia, and positive galvanism should preclude sepsis in compound fractures. A diet rich in vitamins and mineral salts is needed. Parathyroid, thyroid, or other medication may be indicated. Proper physiotherapy will prevent or cure infection in compound fractures or osteomyelitis. It probably will take considerable time, but it is better to devote months to quartz therapy in saving a patient than to losing him with minutes of surgery.

About 50 per cent of finger and hand tendon sheath infections can be prevented by pressing the water cooled lamp forcibly against the finger or hand and giving blistering doses of ultra violet on all four sides. Fifteen to twenty minutes is not too long over a calloused

part. Twelve hours later, if the infection is not subsiding, open up the tendon sheath, immerse the entire portion under the surface of a photosensitive dye—like gention-violet, acriflavine, brilliant green, or crystal violet in one to one thousand parts of distilled water—and give another second degree erythema by leading ultra violet energy under the surface of the dye with a solid quartz applicator. It is always well to give an injured person first degree general bodily irradiations to stimulate the fighting forces of the body into action. Adequate quartz light therapy will so control infection that deformity and impaired function will largely be prevented. No germ has yet been discovered that can live longer than twenty-five seconds when brought in optical contact with ultra violet energy.

In a former paper I pointed out that ultra violet energy is responsible for the productions of the vitamins which control conception, intra-uterine growth, growth after birth, and maturation of the human as well as all animals. This being so, one could logically conclude that ultra violet energy plays a large part in the prevention, alleviation, and cure of the diseases met by the pediatrician, gynecologist, and obstetrician.

Sore or cracked nipples and abscessed breasts are prevented, benefited, or cured by ultra violet energy. Daily first degree reactions applied to normal breasts will keep them normal; better still, first degree reactions applied daily to the entire body will increase the vitamin and mineral content as well as the immunity-conferring property of the mother's milk, ensuring a healthy baby. If the mother has not had quartz light therapy and consequently develops an abscess of the breast, a moderate sized incision should be made into the abscess and it should be flooded with a photosensitive dye and given daily second degree erythema doses until cured. The breast is given a second degree erythema and the body a first degree erythema.

Nursing mothers often suffer from subinvolution of the uterus which can be relieved by second degree doses applied to the vaginal vault and cervix through a bivalve speculum and a Sharp localizer on the water cooled lamp. Infections of a lacerated cervix are greatly benefited by irradiating the entire vaginal vault as well as by producing second and, at times, third degree erythemas directly on the ulcerated surfaces, using a solid quartz rod. In leucorrhoea and gonorrhoea, quartz light therapy is of very great value, especially when combined with diathermia and, occasionally, electrocoagulation of the ulcers. The use of positive galvanism (zinc ionization) and the overcoming of sigmoidal stasis by the sinusoidal currents should be routine treatment. One should always build up the general health of the individual with air cooled ultra violet energy.

Long continued lack of proper vitamins undoubtedly so lowers nutrition that infection or irritation can produce a gastric or duodenal ulcer. McCarrison experimented with pigeons, monkeys, and guinea pigs, and induced every known disease of the human digestive tract, by feeding them "deficiency foods," chiefly the refined grain foods of civilization. Parathyroid deficiency is present in ulcer cases. Ulcer patients are dyspeptic, discouraged, and at times disagreeable. People well tanned with quartz light are usually healthy, optimistic, energetic, and happy. Only emergency operations should ever be performed on ulcer patients until they have had the benefit of quartz light therapy. The writer has given hundreds of treatments to patients diagnosed and treated by other physicians as gastric or duodenal ulcer, hyperacidity, nervous indigestion, catarrh of the stomach, etc., and in practically every case seen relief afforded throughout the duration of a slight second degree erythema. Practically no patient has symptoms of hyperacidity as long as their body, especially the epigastric region, is well reddened with ultra violet energy. The reason for the relief of symptoms may be that the stimulation of the Head zone reflexly floods the stomach and intestines with a rich blood supply and tends to produce normal function of these organs. Ultra violet is a true analgesic. Ultra violet energy balances disturbances of endocrines.

The feeling of well-being following biologic ultra violet energy is not psychic. If it is psychic, then it must be admitted that lizards, birds, and practically the entire animal kingdoms are subject to the same psychic influence to which man is so subjected, because lizards, birds, and animals, sick or well, tend to come out in the light in the early morning and late afternoon hours; they avoid the heat of the sun; in other words lizards, birds, and animals seek ultra violet energy and avoid intense infra red energy. Animal instinct teaches us that ultra violet energy is needed to maintain well being.

Basal metabolic tests show that long ultra violet rays increase metabolism and that short

ultra violet rays decrease metabolism; gastric analyses show that biologic ultra violet energy tends to induce normal gastric secretions.

In practice, I attempt to find out if each patient has the proper amount of vitamins and mineral salts, and also the state of the glands of internal secretion, believing that this information will often reveal the cause of the acute condition for which the patient sought relief. Treatment is usually based on an attempt to supply to the patient a proper balance of vitamins, mineral salts, and internal secretions.

Grant and Gates (Journal of Gen. Phys., Baltimore, July, 1924), state that general ultra violet irradiations of normal rabbits produce a hypertrophy of the parathyroid glands, in some instances to more than half the normal weight. The hypertrophy is a true hyperplasia of the parenchymatous tissue. The parathyroids appear to regulate the retention of the normal amount of calcium in the blood and tissue and thereby indirectly act as a sedative and regulator of nerve impulses. They also appear to regulate the acid-base equilibrium of the blood, thus being a potent factor in the prevention of acidosis and alkalosis. Further, they appear to destroy quanidin—a poison which appears in the body as a result of the imperfect metabolism of proteins. An accumulation of quanidin produces tetany, convulsions, eclampsia, epilepsy, chorea, fatigue, exhaustion, loss of weight, and lowered body resistance to irritants and infections of all kinds.

Vine (N. Y. Med. Jour., April 4, 1923), believes that the calcium regulating influence links the parathyroids up to every cell in the body, acting as a stimulant of cell activity. An insufficiency of parathyroid activity results in a decreased amount of diffusible calcium in the blood.

Patients with paralysis agitans, certain forms of epilepsy due to deficient calcium, chorea, and spasmophilia, have been benefited with ultra violet energy. Varicose, gastric, and duodenal ulcers are associated with parathyroid and calcium deficiencies and are benefited by ultra violet energy and specific treatment. All chronic infections are characterized by continuous absorption of toxins from septic processes, such as rheumatism, chronic middle ear disease, sinus inflammations, mucous colitis, dermatitis, eczema, and psoriasis and are associated with parathyroid and calcium deficiencies and as such call for glandular therapy along with biologic ultra violet energy.

Parathyroid deficiency is thought to be present in threatened eclampsia, sciatica, chronic rheumatism, rheumatoid arthritis, osteoarthritis, arteriosclerosis, urticaria, eczema, sprue, chlorosis, menorrhagia, and prostatic hypertrophy.

Watery diarrhoeas without adequate dietary indiscretions are supposed to be due to vagotonia, *i. e.*, stimulation of the parasympathetic nervous system. Paradoxically spastic constipation is also credited to parasympathetic stimulation. Watery diarrhoeas, in fact diarrhoeas of all nature, seem to be greatly benefited by biologic air cooled general bodily irradiations. Parasympathetic, cranial sacral, vagus or autonomic nervous system are practically one and the same thing. It supplies no branches to the skin, as does the sympathetic, but it does supply inhibiting branches to all the organs to which the sympathetic system supplies incitor branches. Ultra violet energy penetrates the skin sufficiently deep to stimulate the incitors, but cannot penetrate to the depressors or inhibitors. Very likely the stimulation of the incitors overcomes the vagotonia or parasympathetic stimulation and thus checks the watery diarrhoeas. Often one ultra violet irradiation will check these diarrhoeas, and it would not seem that this rapid improvement could be due to the toxin destroying qualities of ultra violet. Certainly one or two general biologic irradiations cannot build up immunity against infection sufficiently fast to account for the checking of the diarrhoea on the assumption that the bacterial flora of the intestinal tract has been changed. This checking of watery diarrhoeas has occurred in a sufficient number of patients to whom no drugs were given to force the impression that it was a result of the ultra violet energy on the sympathetic nervous system.

Impotency and sterility are often due to endocrine deficiency, as well as the result of inflammation. Impotency in male or female is practically always cured by adequate ultra violet energy provided that there is sufficient sexual glandular tissue present to function. The result of a series of treatments is astounding and in every way preferable to glandular implantation. The secretions of the chromaffin tissue of the suprarenal medulla is increased, and its absorption automatically stimulates gonadal secretion. Increased sexual virility increases apace with increased health. The increased sexual virility of husband and wife is often all that is necessary to overcome childless marriages. Pelvic congestion produces pelvic tenderness which in turn

makes the sexual act painful or unpleasant to the female. This inflammation can be removed by adequate quartz light therapy applied to the pelvic organs.

Insomnia, as well as all nervous manifestations, is benefited by gradually restoring the body to health with biologic air cooled ultra violet energy. The weaker the patient, the more gradual must be the restoration to health and consequently the milder the initial erythema.

Deficient thyroid metabolism, high protein diet, and infection stand out as causes of arteriosclerosis. Deficient thyroid metabolism is controlled by feeding thyroid substance plus ultra violet energy. Infection is controlled or lessened by ultra violet energy and other suitable adjuvants. Arteriosclerosis calls for biologic ultra violet energy to regulate metabolism and to build up muscle. Ultra violet energy builds heart and blood vessel muscle as well as skeletal muscle. This is shown by the increased efficiency of the heart muscle after a series of biologic ultra violet energy in cases of valvular heart disease. Any infection of the heart or its valves calls for biologic ultra violet energy. Any infection, anywhere, any time, in any body is benefited by ultra violet energy.

The water cooled lamp is of great aid in sterilizing, healing, and relieving pain and discomfort from syphilitic sores or lesions. The author has stopped with one treatment the large syphilitic chancres which were rapidly destroying the glans penis and with subsequent treatments stimulated healing. Medical diathermia, using a small electrode over the syphilitic sore, is of great value. Syphilis is more easily cured when ultra violet energy is added to the other means of treatment. The well tanned physiological skin will absorb more mercury and will not break out in small pimples. There is practically no danger of infection from hypodermic injections, and sloughing is much less liable to occur. Metabolism is increased. The physiological skin takes a load from the kidneys, tending to prevent nephritis.

Nephritis may be associated with calcium deficiency. Very gradually tanning the skin, without causing a severe redness or desquamation will help every case of kidney infection or disease. I believe that the actively functioning skins brought about by biologic ultra violet energy will do much to lessen the work usually done by the kidneys, and lessening the burden of the kidneys will do much toward allowing recovery. Doctor Reyn, director of Finsen Institute of Copenhagen, Denmark, told me personally that he believed that light will benefit any diseased condition. He thought that intensive irradiations might do harm in far advanced kidney or heart diseases. Over twenty-seven years of work at the Finsen Institute had not demonstrated that intensive doses would do harm. It had conclusively demonstrated that mild doses of light were of great value in treating far advanced kidney disease and far advanced heart disease.

When a man of Doctor Reyn's experience states that light will benefit any condition (diabetes not excepted) with the possible exceptions of the two above mentioned, it would seem that I am justified in concluding with the statement that if the patient has infection, toxicity, needs more or better blood, needs balancing of internal secretions, has any injury, pain, or physical discomfort ultra violet energy is indicated.

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Ultra Violet Ray in Pain; With Case Reports*

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THE use of ultra violet therapy, like all the modalities of physiotherapy, has its definite place in medicine. How definite or accurate the results of individual operators will prove to be, will determine the ultimate place any modality or therapy may hope to enjoy. There are, however, some conditions in which physiotherapeutic measures are not often tried and some which demand a deviation from the general or standard rules laid down for treatment. The relief of pain is one of the conditions which is rather general and often difficult to treat. Perhaps its treatment by the ultra violet lamp is not so new to most of you, yet I shall outline some case histories which I hope

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will prove sufficiently interesting to merit your attention.

All of these cases in the following report, sought relief from pain from one or another cause. The cases selected for this report are those in which pain existed about the head and neck and which was of rather long standing. The etiological cause of the pain was discovered and its removal either had been effected or was being undertaken.

CASE NO. 1. Miss R. B., 22 years old, saleslady. In the past two years had suffered with painful seizures involving the facial areas. These were rather infrequent at first and were referred to some dental condition for which the correction was undertaken. Several teeth were removed and bridges made. The pain was again noticed and subsequently other teeth removed and new bridges made. The attacks of pain began to develop more often and with greater severity until previous to my seeing her she was subjected to attacks daily at eleven o'clock. When these attacks came on the patient would be referred to the medical clinic of her place of employment, where usually she had to be given an injection of morphine to relieve the pain. Her depression and pain prevented her returning to work for two days following such an attack and she would work but to eleven o'clock and repeat the performance.

X ray of the teeth pictured some nonvital teeth on the painful side but no areas of rarefaction or alveolar absorption. The patient refused to have any additional teeth removed, so after looking into the patient's habits and the regulation of hygienic measure, radiations of ultra violet rays as produced by the water cooled lamp were given.

Using a quartz throat applicator, the rays were directed upward, backward and inward from a point between the cheek and the upper maxilla just behind the position of the second molar. Radiations of increasing duration which began with two minute sittings and ended with five minutes were begun. Radiations from the same lamp at a six inch distance were given over the skin area externally. These treatments never extended over three minutes. The first treatment was given at the time of an acute seizure. The patient was advised to go home and remain quiet. To the surprise of all, the patient reported for work on the following morning and was immediately sent in for her second treatment. This was given her, and she reported that although she experienced considerable pain during the previous day and night, it was not of the severe character that it had been nor severe enough to have to resort to more than several doses of a mild sedative prescription which she had been given. The next day she reported again and said she experienced very little pain for which she took aspirin and was relieved. After the fourth treatment the patient was told to skip a day but instead she stayed away for several days and when she returned she complained of the return of pain, but not of the old intensity. At this time the treatments were given on successive days and then for four treatments an additional day interval was added. After the tenth treatment the patient again stopped coming but, however, reported that she had no pain. She was seen at rather regular intervals until recently, which is over a period of four years and there has been no return of pain.

CASE NO. 2. Mr. S. B., a traveling salesman with headquarters in New York City, had subjected himself to the removal of all the teeth in his upper jaw for the relief of pain in the right side of the head. This pain was described as neuralgic in character and only relieved with morphine. It was for a dose of morphine that this patient presented himself at the office one morning after a sleepless few nights previous to his arrival in this city. He was induced to allow me to give him the treatment as described in the previous case, with the most happy results. He returned to his hotel after the first treatment and was able to rest and even sleep in comfort. (No morphine had been given.) This patient received treatments for the next five days after which time he left the city. Each year for the past three years he reports to me on his arrival in New Orleans, and he reports that there has never been the slightest return of pain since the treatments.

CASES NO. 3, 4 and 5. Mrs. I. F., Mrs. E. M., and Mrs. D. B., are all cases with a history of neuralgia of the tri-facial type all of which found relief through ultra violet radiations after the manner described.

Two additional cases merit more detailed histories.

CASE NO. 6. Miss M. R., was referred to me by her father, a local physician. Pain in the upper right jaw was the first noticeable symptom. A tooth was ordered removed for its cure but the promised relief did not materialize. Infection of the sinuses was suspected but none found. In addition to the pain, this patient developed a swelling of the tissues of the face

to such an extent that the wearing of glasses was impossible. The use of the eyes without the correcting lenses increased the pain so that the patient was necessarily kept at home, quiet and in the dark. At the time of the first treatment, in this case in addition to the technique previously described, a localizer tube was used and the unfiltered rays allowed to play over the roof of the mouth. A nasal applicator was used to ray the frontal sinuses and nasal areas, and by blocking off the eye-balls with block tin shields, the rays were directed onto the face. The following day the patient reported that she had experienced the most comfortable night she could remember since the onset of her trouble. Eight treatments in ten days sufficed to relieve this patient of all her symptoms and to reduce the swelling so that she left this city for her home in Chicago. I have not heard from her directly, but on several occasions her father, the physician, informed me that she had experienced no further trouble.

CASE NO. 7. Another more recent case, yet never-the-less strikingly surprising case of the relief of pain by ultra violet radiation can be reported in the case of Miss A. L., 43 years of age, a school teacher who had suffered for a number of years with lumbago. Some teeth had been removed for the relief of this painful condition without results. Six months prior to the patient coming under my care, she developed a facial neuralgic pain which later involved the ear and the right brachial areas. Her teeth were again examined and pronounced good and no extractions were done. On x ray examination of the whole mouth, eight teeth were condemned, four of which were ordered out at once. This done, the pain in the ear, face and shoulder did not relieve as was anticipated, but the lumbar pain began to subside. Healing of the mouth progressed normally yet the pain in the head and shoulders persisted. (The teeth were removed by alveolar resection.) Two sittings under a radiant lamp failed to cause any of the pain to subside. One week after oral operation, treatment with ultra violet ray was begun and within twenty-four hours the patient reported some amelioration of pain, first in the ear, then the shoulder and lastly over the face. The technique used was the same as used in the previously reported cases only the open method of radiation onto the wound areas was substituted instead of the use of the quartz compressor application. It was noted that the mouth tissues almost immediately took on a healthier appearance and all the acute congestion subsided. In nineteen days this patient had ten treatments, two of which were by the radiant light and eight by ultra violet. This patient reported just previous to the opening of the school session and she had had a two months vacation without the slightest pain.

Pain about the erupting third molars, where x ray pictured no impaction was similarly relieved in nine of eleven cases with two treatments. The other two cases required four and six treatments respectively and the application of mercurochrome to relieve the local infection which was present.

The last case I wish to report at this time is rather unusual and I believe the results as striking as the treatment was unusual.

CASE NO. 8. Mr. C. B., 63 years old, an iron worker, was referred to me to determine if any infection about the oral cavity could be an aggravating cause for the continuation of an infection of the left eye. The patient had suffered a trauma of the eye with the development of an ulcer which did not show any tendency to heal; in fact it was progressing to such an extent that perforation was looked for at any time, and subsequent enucleation of the eye proposed, and anticipated by the patient. No infection about the mouth was found. The patient was disappointed for he was in hopes that there would be some infection found so that something could be done to relieve the intense pain, which was causing loss of sleep, although heavy doses of narcotics were being administered. After making my report to the referring physician, I stated my observations in neuralgia cases and offered to see if the pain in this instance could not be relieved by means of ultra violet rays. With his consent, the treatment was undertaken. With a quartz applicator the areas in the back of the mouth was treated as first described, then followed with the open tube over the same area and directed against the roof of the mouth. A total time unit of eight minutes was given in the mouth at the first sitting together with a treatment of one minute and a half over the left side of the face. With an increase of one minute on each of the three intra-oral applications and a half minute increase of time on the external application, the second treatment was given twenty-four hours later. The patient reported very little change, and pain continuing about the same. At the time of the third treatment, however, the patient reported that there was a marked relief from pain and

that he had been able to sleep well for the first time in several weeks. His appearance also indicated the improvement. At this treatment the time interval was again increased to five minutes while the external radiation was discontinued. The fourth treatment was given forty-eight hours after the third treatment, since there was complete cessation of pain and the patient took it upon himself to stay away. At the time of this treatment it was noticed that there was decidedly less congestion of the eye and that there were lighter places appearing on the sclera. The time interval was again increased a minute and a day added between each of the successive treatments until ten treatments were given, at which time there was no undue redness of the sclera and no pain. The oculist's report was to the effect that the ulcer showed signs of healing. This patient was subsequently discharged by him, six weeks after the last treatment by me, with the ulcer healed and about 40 per cent of vision in the left eye. I have not heard from this patient since, but it has been reported to me that he has never had any further pain or trouble from the eye.

As I stated in the opening paragraph of this report, I was not going to discuss this subject as to cause and effect, I shall refrain from doing so, and leave you to draw your own conclusions from these reports. However, I cannot keep from making one comment and that is that in my hands I have found the ultra violet ray a potent pain reliever. I refer to both the air cooled and water cooled types of lamps. The former has given excellent results in the pleural pains so often met with in tuberculosis, as well as to relieve the muscular abdominal pain of continued coughing, while the latter is reserved for work about the body cavities. Even the pain of laryngeal tuberculosis is amenable to the ultra violet light properly administered.

It has been my observation that the mucous membranes withstand a rather larger dose of ultra violet radiation than the epidermis does, yet there have been times when an overdose was given. This, however, seldom was more severe than to temporarily increase the pain, which was entirely local, even in the event of there being a subsequent exfoliation of membranous surface. For the relief of this pain or discomfort aqua calcis from 20 per cent to full strength was used with good results.

In closing I want to say that there have been but comparatively few disappointments, and from my personal experience, I feel that ultra violet rays minimize the necessity for the use of sedatives and narcotics, and shortens the time of healing. I hope that close application of these modalities may bring forth similar encouraging reports.

The Treatment of Systemic Infection With the Actinic Ray; With Report of Cases*

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INFECTION *per se* is the arch enemy of mankind. It is the causative factor in over 90 per cent of all deaths. This being the case, what have we, outside of possibly one or two specific medicines, some vaccines and antitoxin, with which to fight it? We must rely on sustaining our patient with stimulants and tiding him over the critical period and trust to the "All Wise and Powerful One" to create in said individual a so-called immunity to that certain type of bacteria and thereby overcome the toxins or the organism itself, lest it overcome our patient.

The treatment of infection started when the practice of medicine began, and from that time to this there has been a war waging between living cells in the body and invading bacteria from the outer world just as desperate and to the bitter end as those struggles between ferocious beasts in the wilds of Africa. Although not so spectacular to the naked eye, yet they are as effectual as regards life and death; and it is this constant condition to which the body is subjected and towards which the practicing physician looks with dread, for in his ability to fight infection lies his chance of success,

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for, as the years roll on, one disease after another is added to the list of infections or is found to be caused by some form of infection directly or indirectly.

The title of this paper may be a trifle misleading inasmuch as systemic infection might mean the invasion of the system with most any type of bacteria; but as here referred to, your attention is called more particularly to the invasion of the blood stream with streptococci, or their toxins, in their various forms.

In the past twenty years of general practice, it has been my lot to observe several severe cases of infection, some of which were a sad commentary on our prophylaxis and others on the treatment instituted. Especially in the puerperal type of sepsis, the general nursing, together with "watchful waiting", did much for the patient, but alas, very little for the disease, and if the patient was able to build up an immunity to the disease she recovered, otherwise she succumbed.

In order to have infection there must be invasion of the tissues or fluids of the body with pathogenic organisms accompanied by a diminution in the resistance of the tissues or cells of the body which allows the bacteria to invade them.

For years doctors have been fighting a losing battle with bacteria, although combatting them with chemical poisons. The trouble lies in the fact that these chemical poisons not only do not reach all the bacteria but they very markedly lower the vitality of the very cells that are being encroached upon. In other words, much of the fight is taken out of them. In using the mercury quartz light, we are able to combine two very important factors in the fighting of infection, since it possesses two very important properties: (1), it is bactericidal; (2), it is restorative. It not only kills the bacteria but it regenerates the cells that are being assailed by the bacteria.

Sajous divides general infections into three groups: the toxemias, the septicemias, and the pyaemias, all of which are usually referred to under the general term of blood poison.

Toxemia or sapremia is generally understood to mean the absorption of poisons generated from bacteria and as such they tend to poison the patient, and if severe enough, cause death. You are all acquainted with the general symptoms of toxemia, which begin with a chill soon followed by an irregular temperature ranging from 100 to 103 or even 104 degrees, pulse 110 to 140 and respiration increased. The skin is usually hot and dry and there are sometimes nausea and vomiting. Usually, if the infection is allowed to proceed, there is increased weakness, prostration and finally delirium, coma and death if the infection is progressive.

Semmelweis, the great obstetrician in 1847, described the condition and knew that infection was transmittable from one patient to another, although bacteria was not known to be the cause. We know now that puerperal fever is nothing more or less than an infectious disease and one of the cases here reported is of this type. As you all know, it is rather disconcerting to attend one of these cases, for there is always a question as to the origin of the infection. No less a professor than Dr. Jaggard taught that all cases of puerperal infection were introduced from without, and when a patient took sick with puerperal sepsis some one was to blame. However, we know now that this is not always the case, for, although the cause may usually be exogenous in origin, at times there is every indication that it is endogeneous, arising from within the patient herself, that is, auto-infection. Regardless of the origin, the effect is the same in the layman's mind and the accoucher generally bears the blame. It constantly confronts us to use every modern means to save the patient's life.

CASE HISTORIES

CASE NO. 1. Mrs. M., age 32. Family history negative except that father had tuberculous hip in advanced years.

PERSONAL HISTORY: Patient has always been well until last six weeks, during which time she has had hyperemesis gravidarium. August 11th, following intravenous injection of Fisher's solution, patient aborted. Hyperemesis ceased following injection of the Fisher's solution but on the third day patient had a severe chill and high fever. This condition continued for several days. At this period I saw the patient, the condition being tabulated as follows: patient quite septic, temperature 103, pulse 120, respiration normal, leukocytes 9,000, pains severe, and paroxysmal in pelvic region. Physical examination was negative. A culture taken from the cervix showed streptococci. All symptoms as time went on seemed to grow more alarming and at the end of five weeks we find the patient with nothing in the cul-de-sac, a rapid thready pulse of 138, temperature 102½, respiration 24, thoroughly septic, scanty

vulvar discharge containing streptococci in pure culture, and the patient was gradually losing ground. A blood transfusion was advised, only to be refused. The mercury quartz lamp was then prescribed and promptly installed in the patient's room on Sunday. Monday and Tuesday were uneventful. A physical examination was still negative except that the patient was very septic with a temperature of 103, pulse 130, and a leukocyte count of 13,000. On Wednesday, a slight induration was felt in cul-de-sac, temperature 102, pulse 120, respiration normal. On Friday, a distinct mass was felt in cul-de-sac, but the pulse and temperature remained the same. On Sunday, this mass became fluctuating, so that operation was decided upon to drain the cul-de-sac. Before same could be arranged spontaneous drainage took place through the vagina, all symptoms promptly disappeared, and the patient regained normal health in a very short time.

CASE NO. 2. Mrs. M. W., age 60. Family history negative except has had several severe attacks of inflammatory rheumatism.

PERSONAL HISTORY: General examination showed no impairment to the heart, lungs, kidneys or other organs. Present illness began April 2nd, one week ago, with severe pains in the back and limbs, together with a sore throat and a swelling in the region of the cervical glands. This swelling occupied all the space from the sternum up to the inferior maxilla, pushing the head up and to the left. There was no fluctuation but tenderness and redness were extreme. There were two other similar phlegmonous areas on either leg below the knee, all three having about the same general characteristics—extensive swelling, very red, tender to the touch and painful. The patient's general condition was not good, temperature 102.4, pulse 120 and very weak, and respiration 30. She had been somewhat delirious, especially at night, and examination of the chest showed bronchitis. She had been given antirheumatic treatment and had morphine to quiet the pain. Heat had been locally applied to all painful areas. As there was no recession of symptoms and the patient was getting weaker, it was thought best to apply the mercury quartz lamp. This was done April 11th, two days after our first visit. On April 14th, three days after giving the first treatment, it became quite apparent that the patient was much better, and instead of pus forming in the swollen places as was expected, they became smaller and no fluctuation appeared. On April 19th, which was eight days after the first treatment was given, all swelling had disappeared, no surgical measures were necessary, the lamp was discontinued and the patient made an uneventful recovery—sitting up the day following the last treatment.

CASE NO. 3. Mrs. S. S. McK., age 62. Family history negative.

PERSONAL HISTORY: Patient never strong. Following the flu, areas of inflammation appeared about the elbow and knee, which were very tender, swollen and painful. The fever at this time ranged from 99 to 102½, pulse 80 to 85, and the medical treatment given was antirheumatic and supportive. Heat was applied to inflamed areas. Actinic ray was advised for this patient for its tonic effect and beneficial action in infection in general, but same was refused. Eight days later temperature raised to 103, pulse 110, respiration 28, elbow and knee became much more swollen, ankle became red and a beginning inflammation on other leg below knee made its appearance. At this stage, Dr. Page of Des Moines, saw the case with me and urged the use of the actinic ray, which was started April 28th, twenty-two days after the beginning of the disease. At this time, pus was extracted from the knee and a pure culture of streptococci veridans was obtained. Patient at this time was exanguinated, temperature 104, pulse 140, respiration 28, leukocytes 17,500, hemoglobin 60 per cent, with the patient delirious at times. It seemed to me a hopeless job. Actinic treatments were given twice daily. Another inflammatory area had begun in the region of the left clavicle. This, however, was soon checked. It might be well to state that the patient's stomach was refractory to any medication and the food was ejected at times so that the topical applications and two intervenous injections was the sum total of medication administered. On May 5th, seven days after starting the lamp treatments, the patient's condition had somewhat improved, temperature 101, pulse 120, respiration 24. She slept better and was eating a full tray. Soon fluctuation was elicited at the knee and elbow. Dr. Baker of Des Moines operated, putting a tube through the knee joint and at the same time drained the elbow. Four days later I drained the ankle and the area back of the knee on the other side, this being the last surgery required—the patient going on to complete recovery.

REMARKS

In a paper by Dr. George Martyn read before the Section on Nervous and Mental Dis-

eases American Medical Association in this city (Chicago) in June, is but another illustration of the effect of the quartz light upon septic infections. He states that in the treatment of backache, as a palliative procedure, he uses the mercury quartz air cooled ray. It brought in some cases, relief which lasted for many months. In others, it simply relieved the pain for a few hours; but in all cases it brought this valuable help—relief of pain until a study had been made of the cause which, of course, as you know, is generally focal infection; also, he states that the ray has one other advantage—it increases very markedly the general nutrition of the body through the blood stream. This is shown clearly by the largely increased lymphocytosis after its use. These patients when they come under our observation are always exhausted and in low nutrition as a result of the long standing toxemia and pain.

If the report of these few cases throws any further light on the treatment of systemic infection, if the mercury quartz light can but throw the balance of power onto the side of the patient and away from the invading bacteria, I say, if this works out, it seems to me that in the mercury quartz lamp we have a very valuable aid in the treatment of that dreaded condition—Systemic Infection.

DISCUSSION

Dr. A. D. Willmoth (Louisville, Ky.): I have listened with a great deal of interest to this paper and I think that it is too important to go by without some discussion.

The gentleman's opening remarks of infection as being the great enemy of the physician, and particularly of the surgeon, prompted me many years ago to begin work with the ultra violet lamps. I have not found them disappointing when properly used on properly selected cases.

Let me refer to only one troublesome malady. If you will take your erysipelas cases, which none of us like to handle, and will give them a general irradiation with the air cooled lamp sufficient to produce an erythema and then go over the area involved with your water cooled lamp and give it a good burning, so to speak, up to the point of activity from the lamp, you will get splendid results in practically every case. So far I have not been disappointed.

It is my opinion that when you can get to the infection, or near enough that you can get the effect of the ray, you will certainly get results.

I just wanted to add my testimonal to the splendid paper that Dr. Sherman presented here to let him realize that I enjoyed every particle of it, which I know every one of you did.

Dr. Leo C. Donnelly (Detroit): I just want to add one word about ultra violet radiation and infection. For several years I had the privilege of treating many tendon infections of the hand—cases referred to me by Dr. George of the Packard Motor Car Company.

We found that about one-half of those patients when treated with a water cooled lamp, giving a blistering dose on all four sides of the finger, and a general ultra violet radiation over the entire body, needed no further treatment. In the other half we had to open up the tendon infection, immerse it in a solution of chemical dye and apply the light. Since that time the Packard Motor Car Company have had installed a general physiotherapy installation, so I no longer get their work, but Dr. George of the Packard Motor Car Company is under the impression that by the use of ultra violet energy he is able to save about 90 per cent of the fingers which he formerly would have had to amputate and that about 50 per cent of the disability is prevented by the use of ultra violet therapy in the factory immediately after the man is injured.

Dr. B. H. Sherman (Dexter, Iowa): I want to thank the doctors for their discussion and add just one word. This has opened quite a wide territory. We started everything and we were not able to touch on all the things, but we have had some experience with erysipelas and I believe it is either seven or eight cases we have treated of severe erysipelas, receiving them anywhere from one to four days after the infection had started. As you know it starts in a hurry, and we simply give them a treatment just short of producing a dermatitis and the results have been fine. In fact, that is the one infection to treat with the air cooled lamp. We did not use the water cooled lamp on any of these cases, but we had fine results.

I think our average number of treatments was two, there being one case that we gave four treatments and I consider the last treatment or two as wasted.

The Streamer Discharge; a New Electric Phenomenon*

GENERAL ELECTRIC COMPANY
Schenectady, N. Y.

WORKING with less than a millionth of a gram, or billionths of an ounce, of vaporized tungsten, Dr. Irving Langmuir, C. G. Found and A. F. Dittmer of the research laboratory of the General Electric Company at Schenectady, N. Y., have discovered a spectacular and beautiful electric discharge which gives promise of leading to a much greater understanding of vacuum phenomena.

Glowing golden globules, which seem to have characteristics similar in many respects to those described as belonging to ball lightning, were observed when a trace of tungsten was introduced into an argon filled discharge tube. Thus it is possible that in ball lightning—to which so many peculiar antics have been attributed—there is an outer surface of positive electric charges, or ions, within which are imprisoned negatively-charged, incandescent particles of matter.

The tube used in the experiment had a tungsten filament at one end, heated to incandescence by low voltage. High voltage between the filament and a small plate electrode at the other end of the tube completed the circuit. Very pure argon, an inert gas, was sealed in the tube at low pressure (2 mm.).

When the filament is lighted and high voltage applied, the direct current flows from the filament, or cathode, to the negative electrode, or anode. The tube glows with the distinctive

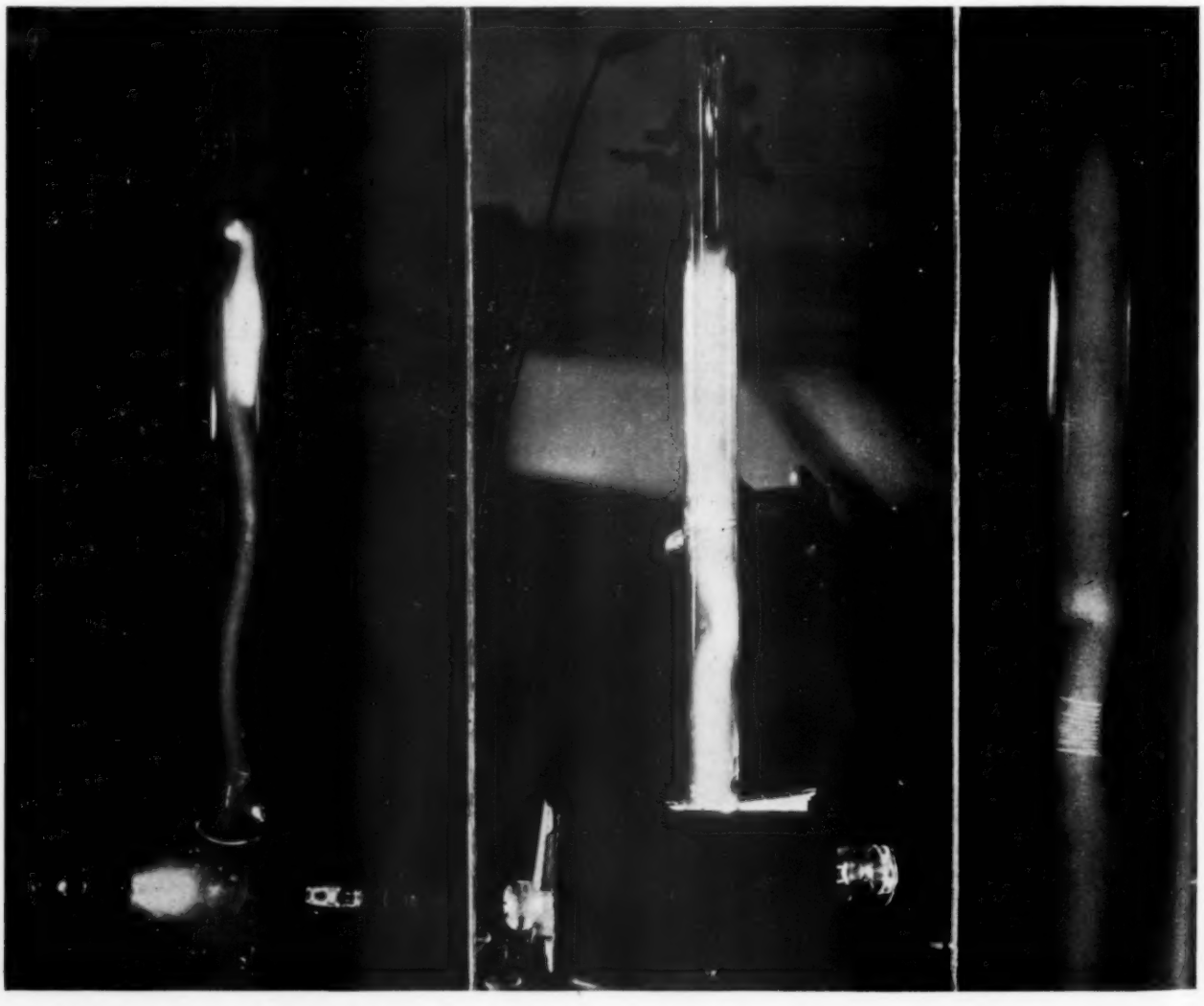

Fig. 1. Argon filled tube used in studying streamer discharge.—"Snake Effect."
Fig. 2. C. G. found affecting arc with magnet.
Fig. 3. Incandescent globules traveling across the tube.

purplish red color characteristic of the argon tubes of Tungar rectifiers.

No effect is apparent when a magnet is brought near the tube.

If now the temperature of the filament is lowered momentarily by cutting off its current for a half second, fewer electrons, or electrical conducting particles, are given off by the filament. The result is that the voltage across the arc jumps from 20 to 100 or more volts for a second. This increase in arc voltage in turn causes tiny particles of the tungsten filament to be "sputtered" into the argon vapor. The amount thus "sputtered" has been determined by repeating the process thousands of times—until an appreciable amount of tungsten was thus torn from the filament. It could then be determined that each sputtering consumed less than a millionth of a gram of the metal.

In spite of the small amount of tungsten emitted, the effect produced is astonishing. Brilliant blue flashes rise from the lower end of the tube, and the purplish arc, which previously filled the tube between the electrodes, tears itself away from the tube with the writhing motion of a snake.

The spectroscope, one of the seven wonders of the modern world, reveals the blue flashes as due to tungsten vapor. These flashes disappear after a half minute, in which time the lashing of the argon arc also subsides. Surrounding the column of purple vapor there is a dark area, and outside of this there is a sharply defined, dull yellow, luminous skin. This skin disappears in about a minute.

The arc, previously unaffected by a magnet, has now become very sensitive even to weak magnetic fields. If an ordinary horseshoe magnet is brought near the tube, the arc is deflected as is any conductor carrying a similar current. At the same time the yellow skin appears on the opposite side of the arc; that is, on the side not in contact with the wall.

As the magnet is brought nearer, the yellow skin becomes brighter and thinner, and begins to act like a liquid. Slowly tiny droplets of golden yellow liquid fire are formed. They move along the surface, only to break away and fall, molten spheres of bright white light, into the arc. These droplets can be varied in size from the tiniest of drops to those the size of a pea. They move across the glowing arc and disappear upon reaching the opposite side. The speed can be varied from very slow up to about a foot per second. When they move rapidly, they appear as filaments or streamers, rather than as individual drops.

When the magnetic influence is further increased, the globules become so numerous that they are continuously visible, and finally a part of the tube contains a swirling volume of the luminous particles. The effects can be varied in many ways, and numerous beautiful and surprising results have been obtained under varying conditions. The sine wave, characteristic of alternating current, can be shown very realistically in either of two ways; alternating current can be used for heating the filament or, in addition to the direct current across the arc, an alternating current can also be used. In either case the globule streamer assumes a wave motion, traveling across the arc in beautiful sharp curves, rather than in straight lines or slight curves. Sometimes the arc itself oscillates at about 1,000 cycles per second, and then the streamer appears to be beaded.

If the arc current is maintained, this effect continues for hours before the minute portion of tungsten ceases to function. The effect can then be brought back by again cutting out the filament current for a moment and thus sputtering another trace of tungsten into the argon vapor. If the arc current is shut off for about 40 seconds, the effect disappears—the tungsten has been deposited and the streamer discharge will not restart until more of the metal has been sputtered from the filament.

The arc itself is negatively charged on the outside of the skin, and positively charged within. Due to the way in which the droplets are formed, they are positively charged on the outside, and negatively charged within.

Other elements, such a molybdenum, tantalum and carbon, exhibit this phenomenon, but not in the striking and impressive way that tungsten shows it.

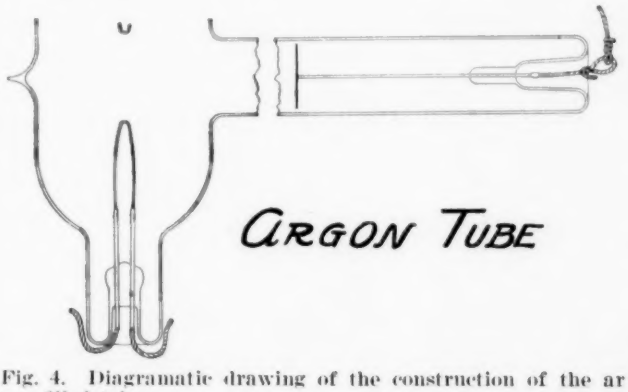

Fig. 4. Diagramatic drawing of the construction of the argon filled tube.

EDITORIAL

The JOURNAL OF RADIOLOGY

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A. F. TYLER, M. D.
Managing Editor

The Essentials For Successful Physiotherapy*

I HAVE not come to read you a paper; I have come simply to talk to you in a close intimate way concerning what is, after all, the real fundamentals of the work we do. Without these fundamentals the work of any physician is haphazard and will in the long run prove a failure. You and I are fond of saying to ourselves that we practice scientific medicine. What really is scientific medicine? Science is derived from the latin "scio"—to know—so we practice scientific medicine and scientific therapy when we know what we are doing. When we do not know what we are doing we are practicing haphazard and chanceful medicine. Therefore, the essential and necessary condition precedent to the treatment of any case—the keystone of the arch of medicine so to speak—is as to whether we "scio" or not, for if we do not know, we cannot rationally and correctly and properly treat a case.

Let us then stop a moment and consider the question of diagnosis. It is my uniform habit to refuse to treat any case until I shall have had an opportunity to find out what is the matter with the patient. Those of you who may possibly have attended the Fischer meeting of 1923, at Chicago, will remember, on that occasion I presented a scheme of mine for diagnosis; both as far as clinical history and physical examination is concerned and also blanks and schedules which I had originated for each and every laboratory process that is necessary for the complete investigation of a case according to the so-called "clinical" method. When a patient comes to me I undertake, myself, the laborious function of taking the history. It is usually the thing that is delegated to the interne or nurse. They ask the patient a certain number of ordinary stereotyped questions, the answers to which are noted and then the patient is passed on to the physician or to whomsoever may be the next person to make an examination. This I consider to be radically wrong. If you were to come to me or anyone were to come as a patient, you have an individuality and a personalty. You have eyes and a nose and a chin and finger prints that are different from every other human being in this world. You have a heart and a mental attitude that are essentially and normally and naturally your own wherein you differ in your viewpoint from every other human being in the world; a mental attitude and viewpoint made up of inheritances not alone from your immediate forebears in the shape of parents but forebears through long generations, and in addition to that you have that peculiar inherency which is so rarely considered, namely, the vast inheritance of the race; a phylogenetic inheritance which started back through the aeons of existence to Pithacoid man and to perhaps, shall we say, although your distinguished Nebraska critic would say to the contrary, to the time when the fuzzy gorilla or chimpanzee artfully found a means to stand erect and became the subject of biped movement with the accompanying ptosis and stasis of the abdominal viscera that is such a distinguishing characteristic of *homo sapiens*—with a question mark after the "sapiens"; and in addition to that you have your physical constitution as I have said, that is entirely different from every other human being and it is for that reason that in my *clinic* I take my own case history. I write them in my own hand writing and make my own physical preliminary examination. I have in this way gathered not only the history of the case

*Address delivered before the X Ray, Radium and Physiotherapy Meeting at Omaha, Nebr., Dec. 2, 1924.

but the peculiar and particular response of that individual with regard to his or her own disease and condition, that is extremely valuable. Sometimes the mere intonation of the voice of the patient in telling of a condition may carry with it a volume of information. When I have gathered this original data then I am in a position to intelligently divide and subdivide the work of my staff, which I do by filling out certain blanks I have for the different men who work with me—for the technician in the laboratory, for the radiologist, for the internal medicine man and so on. I may merely indicate a general examination with special attention upon one single subject. I may put a check mark or star opposite the heart showing that I want very careful consideration of that particular organ. It is thus I am checked up in my clinical diagnosis by the findings of my staff and if my staff differs with me then my staff and I must work together until we have reconciled these differences and if we cannot reconcile them we must keep investigating until we do get them adjusted. In this way we find that the diagnosis is more likely to be a correct one than it would be by simply delegating the drudgery and the preliminary details to the hands of an interne who to say the least is incompetent from lack of experience. Not that I belittle the interne or recent graduate but wisdom, you must remember, is not acquired easily—it is the result of knowledge and past experience and I might say of the interne that he has none of this; he does have the exuberance of youth, a certain amount of technical text book and laboratory knowledge, but he has not that corrective judgment that comes with the years of bitter, humiliating and grinding correction that eliminates the overbearing vanity and self esteem that is not a part of the make up of the ego of the wise individual. I have forgotten what particular witty Frenchman—as there were so many of them who were witty and good that it would fit with any of them—who said of wisdom—"it commences when one realizes how many mistakes he can make." So in the diagnosis of our cases, we try to bring to bear all of the care and all of the thought and all of the accumulative wisdom of the years before we think of anything else.

The patient comes to you wanting to know, "Doctor, can you cure me?" I want to know first what is the matter with the patient and when they ask me, "Doctor, can you cure me?" .....I say, "I don't know."....."Doctor, you don't know?".....Why, certainly not, I do not know what is the matter with you and how can I tell you what I can do for you when I don't know what is the matter with you?".....I have been called by patients a "queer one." Perhaps I am; we are all a little queer. If we were not we would not be such interesting persons to one another.

Now granted that we have made our diagnosis. Let us stop a moment. Let us say that we have gathered together all of the data it is possible to gather; and when all of that is gathered together it represents from ten to twenty-five sheets of the ordinary typewriter size that lies on my desk. I am one of those who believes that the real diagnostician does not try to dodge drudgery—I take these home with me at night and I abstract that entire case into one small sheet so I know the exact condition of every organ, every tissue and every function of the human body. And then I write my diagnosis major and my conditions minor and I am then ready to consider the findings of my patient and see what can be done for him or for her. I am ready to consider what can be done for this patient but in taking that into consideration and weighing it I have to consider what is the underlying pathology of this particular case. If we have underlying a destructive organic pathology it would be as foolish to hope to cure that patient as it would be to try to grow a new finger where the surgeon had amputated one. But even with organic pathology we may be able to heal, to check, and to maintain sufficient function to enable the tissue or organ to "carry on" in a lessened or limited way.

And here I shall again digress to repeat what I said this morning concerning the use of the English language. Early in my life I was taught by my learned father, a really learned man, a learned lawyer and a learned circuit judge, that words had their values and I never, if there is such a thing as always and never, talk about the word "cure." I do not cure patients. Dr. S. is smiling there—he has heard me ride this hobby once before. What the patient really wants to know is, "Can you as my physician, make me active and effective, useful, put me back at my work again so that I can be a valuable unit in the warp and woof of the community?"

There is an interesting psychological feeling attached to the word "cure." I have undertaken to psycho-analyze a few patients in regard to the "*cure complex*" and I will say this, that very frequently "cure" means with a patient that they shall be given a rest, that

their functions shall be so restored, that they shall be so well that they will be able *with impunity* to violate the laws of health and hygiene and live recklessly and joyously as they please. No doctor can do that for them. A doctor who does or tries to so do, will soon himself be a patient and I tell my patients frequently, "You are all like a couple of mules hitched to the tongue of a wagon"—"I cannot cure you and you cannot be cured without me. Without your help and your consent and your labor, all I may do for you will amount to very little. If you do not help me it will resemble the progress of the wagon with the mules hitched one to the shafts in front and one to the tail gate in the rear and each pulling with equal strength. How far would they progress?" As a friend of mine said, "Your choice of mules is not very flattering—why not choose the percherons?" I replied that I purposely chose mules because I thought you should not be classed as a percheron, exalted as the percheron has been by Rosa Bonheur's beautiful pictures. With a correct diagnosis and a knowledge of our pathology the question resolves itself into not alone the labors and knowledge of the medical man, but the reaction and behavior of the patient.

Most medical men have consciences and try far beyond what their patients are willing to credit and patients do not as a rule strive with that whole heartedness that they should. I will say this to you, that I am a very frank, free and blunt spoken to man, woman or child whom I think is not playing the game straight with me as a patient, and I tell them if they are not willing to do as I want them to they can get out and I will get another patient in their place. After a time they usually get between the shafts, meekly put the collar on themselves, hitch up and get the traces onto the hooks.

Whenever you fail to know pathology my advice to you is to take down your books and find out what is the modern pathology of the disease you are treating. You will have a flood of light thrown frequently upon processes that have become dusty and cobwebby, perhaps, and you will not only help your patient, but help educate yourself as well. And so without fear of contradiction I say that it is necessary for one to keep abreast of the times by intensive, thoughtful study of his cases which will teach you more and in a better manner than anything else I know of. On my desk lies a metal basket. If I have a case record and there is in that record one thing that I feel I have not mastered, that record never goes out of that basket until I feel that I have mastered each and every detail, for if I do not understand, I must search. If a short spade won't get it I use a still longer handled spade but I dig, dig, dig and that is the way I have really added to the sum total of the little knowledge I possess of the the diseased human being.

Whenever I sit down to work out a therapy I pay no attention to what A or B or S shows, but I settle in my own mind definitely the pathology and needs of the patient and then apply the principles that govern all therapy and that which is needed in this particular case. If I have a complicated case I will write down the things that I want to accomplish in that case and I will see how many I can reach with one kind of treatment and how many with another and so I work out my therapy; in that way I work out a plan to help my patients. But I will say this, that I am not like the fellow who was presented with a problem in research medicine who said that "it was wrong—nothing to it—I had three years study in research medicine and have completed my education." That kind is helpless, absolutely helpless. He was right—he had completed his education, but had become fixed as the sphinx, immobile and immovable, unchanged and unchanging.

Recently a fellow doctor made a very wise and gratifying remark to me while coming from the hospital to lunch. After talking about various things, he finished by saying, "Well, you ought to feel good."..... "Well," I said, "I do—I had a pleasant trip, and I feel well and happy."..... He said, "You have colloidal value," and I felt highly complimented. If he had said, "You are crystalized," I would have felt pretty badly. I want always to remain in the colloid state—I never want to crystalize and complete my education. The man who feels that what he does not know in medicine would fill an edition of the Encyclopedia Britannica still has a chance—there is still hope for him. There should be a feeling that each and every case brings with it new problems in the study of character, new problems in the question of diagnosis on many things and diseases, a diagnosis and the understanding of the entity of the individual, that embraces his character, his reasoning, his mentality, his physical and his functional activity. All of these things you must feel are new and fresh to you, that they are part of your diagnosis, part of your prognosis; that

you have in this way grouped the underlying pathology not alone as is found in books on biology and anatomical pathology, but you have covered the psychic and physical pathology of the individual case before you and when you have done this then you are in a position to say, "I should follow this line of therapy." Do not feel that because you are doing *physiotherapy* that you need neglect any other form of therapy. Remember that sometimes physiotherapy by itself will fail but by combining it with drugs or better called chemicals, you will form the combination, secure a response that would have failed had there been no combination.

By planning what is necessary for your patient and then trying to the best of your ability to apply every form of therapy with a full understanding and full comprehension of the case, you hope and expect to secure results proportionate to the possibilities for therapy in this hypothetical or in any real case.

Curran Pope, M. D.
Medical Director the Pope Hospital; President American College Radiology and Physiotherapy.

Sir Clifford Allbutt

THE death of Sir Thomas Clifford Allbutt marks the passing of one of the foremost of British physicians. Having devoted his entire gifts to the furthering of the medical profession, he has received practically every honor that could be betsowed upon a worthy British physician.

Thomas Clifford Allbutt was born July 20, 1836. After a preliminary education at St. Peters, York, he entered Caius College at Cambridge. His first public services were rendered as consulting physician to Leeds General Infirmary, to Belgrave Hospital and King Edward VII. From 1889 to 1892, he served as physician to Addenbrooke's Hospital, Cambridge, and as commissioner in lunacy. As a member of the Council of Royal Society, 1896-98, he established himself as editor of a system of medicine and gynecology that has been recognized as a classical contribution to medicine. The celebrated series of Lanes Lectures on *Diseases of the Heart* were delivered during this period. From 1914 to 1916, Sir Clifford Allbutt served as Vice President to the Council of Royal Society and became an Honorable Fellow to the Royal Science of Medicine. He was later a member of the Committee of Home Office for Trade Diseases, National Medical Research and other government and Royal Society committees.

Sir Clifford Allbutt was particularly recognized as a medical writer with a pleasing and powerful literary style, portraying the most difficult and most vague aspects of medicine in an illuminating manner. This style characterized the system of medicine, and his two volume monograph on *Diseases of the Arteries and Angina Pectoris.* He was also a great contributer to the literature of medical history, including in his scope, medieval science, Greek medicine in Rome, Byzantine medicine, and the historical relations between medicine and surgery. Towards the progress of medicine, he established the significance of the use of the ophthalmoscope in medicine, delivered a series of observations on visceral neuroses, established a unified, systematized concept of medicine as a science, and invented the clinical thermometer.

His untimely death on February 22, at the age of 28 years, left vacant the chair of Regius Professorship of Physic in Cambridge University, which he had held since 1892.

Sir James MacKenzie

THE disease to which he devoted his last efforts and which served as the climax to his studies on cardiac diseases brought about the death of Sir James Mackenzie, the greatest authority on diseases of the heart, after a year's suffering from angina pectoris.

Sir James Mackenzie was born in Scone, England, in 1853. After the routine elementary training he received his medical education at the University of Edinburgh, from which he graduated in 1882. After a term as house physician at the Edinburgh Royal Infirmary, he studied in Vienna, only to return to Burnley, a Lancashire manufacturing town, to settle down to general practice. Here he remained for twenty-eight years, engaged in establishing the foundation for the future revolutionization of cardiology, his efforts being directed towards the development of the physiological pathology of the symptoms presented by the patient and the clinical course of the disease. Two factors he constantly insisted upon—the study of the disease in its earliest stages and its progress, and the unreliability of the laboratory methods; and to facilitate his efforts, a new instrument, the polygraph, was developed to aid in the study of the unified action of the heart muscle. This resulted

in the publication of his first important work, *The Study of the Pulse.*

In 1907, James Mackenzie, M. D., moved to London to carry on the work as a consultant on clinical disorders of the heart. In 1908, *Diseases of the Heart* was published and met with international success. In 1913, he became head of the cardiac department of the London Hospital, but this position he soon resigned to re-establish himself as a general practitioner in St. Andrews, Scotland. Here he hoped to follow the same method of study that characterized his sojourn in Burnley; but medical enthusiasts soon required the foundation of the St. Andrew's Institute for Clinical Research, where the general practitioner was taught the importance of the presented symptoms, their interpretation, and clinical significance.

The name of Sir James Mackenzie will always serve as a starting point for the student of cardiology, and his efforts as the scientific method of research for the interpretation of the simple practical warnings of nature so universally disregarded by the general practitioner.

The American Board of Otolaryngology

THE American Board of Otolaryngology will hold its first examination during the Meeting of the American Medical Association in Atlantic City, May 25th to 28th.

According to the rules of the Board, applicants are divided into three classes.

Class 1. Those who have practiced Otolaryngology ten years or more.

Class 2. Those who have practiced Otolaryngology five years and less than ten years.

Class 3. Those who have practiced Otolaryngology less than five years.

The type of examination is different for each class.

The secretary, Dr. H. W. Loeb, announces that thus far over three hundred applications have been made.

Stomatological Announcement

THE last monthly meeting of the American Stomatological Association, New York State Society, was held on Tuesday, April 14, 1925, 8:30 p. m., in Hasock Hall, New York Academy of Medicine, 17 W. 43rd Street, New York City.

The program of the evening consisted of addresses by such men as Homer E. Smith, M. D., F. A. C. S., New York City; Alfred J. Asgis, Sc. B., D. D. S., New York City; Geo. W. Mackenzie, M. A., M. D., F. A. C. S., Philadelphia, Pa.; Joseph L. Post, M. D., Philadelphia, Pa.; Martin J. Synnott, M. D., F. A. C. S., Montclair, N. J., and Harold DeW. Cross, D. M. D., Boston, Mass.

We wish to call the attention of all professional men to the fact that this was the first time in history of the American Stomatological Movement that the problems of stomatology were presented in their various aspects to the profession at large. At this meeting the International situation was discussed, also for the first time. The attendance was large.

Alfred J. Asgis, Sc. B., D. D. S., Secretary,
Aeolian Hall, 33 W. 42nd St., New York City.

ABSTRACTS and REVIEWS

The Value of X Ray in Obstetrics. J. W. Borland, M. D., Davis Spangler, M. D., Texas State J. M., 20:560-562, February, 1925.

DIAGNOSIS of pregnancy by the use of the roentgenogram is not a recent accomplishment. In the extremely difficult cases, where the diagnosis cannot be made with certainty, as in cases of polyhydrammios, the x ray has been called the fourth positive sign of pregnancy. Many obstetricians have had much hesitancy to subject their pregnant patients to the roentgen ray because of the possible remote results of the irradiation on the fetus. The author, after a careful application of the roentgen ray for diagnostic purposes, concludes:

1. Roentgenograms of the pregnant uterus are apparently without danger to either the mother or the fetus.

2. Except in cases of unusual emergency, roentgenograms should be made before final determination of cesarean section.

3. They are of great value in medicolegal cases.

4. In any suspected abnormality, they will give valuable information even though it may be negative.

5. Fetal abnormalities may be detected more accurately, more certainly, and at an earlier date, by roentgenograms than by any other means.

A Retrospect. Editorial, M. J. of Australia, 1, 12th year: 63-67, January 17, 1925.

IT is the general opinion of those interested in gynecological work in Australia that x radiation should not be used in the treatment of malignant disease of the uterus and breast when operative treatment is available and offers prospects of success. Postoperative radiation is, however, strongly advocated and seems to enhance the chances of ultimate recovery to a considerable extent. When the malignant disease is of modern extent, surgical intervention offers a gloomy prognosis. On the other hand, x ray therapy appears to improve the prognosis, whether it be used by itself or when surgical removal is subsequently performed. Again, in advanced growths, surgery is powerless and radiation appears to hold out some hope of cure, but certainly provides relief to the suffering patient.

Urological Problems of the General Practitioner. Robert V. Day, M. D., F. A. C. S., Harry W. Martin, M. D., Southwestern Med., 9:60-64, February, 1925.

RENAL maladies often give obscure abdominal symptoms making the clinical diagnosis very confusing. In these conditions cystoscopy is frequently contra-indicated. Simple x ray examination will often give the necessary clue. Radiographs of the entire urinary tract, including the prostate in the male, being especially careful even in women, to get as low as the pubis, should never be neglected in conditions even suspicious of disease in the upper urinary tract. In the observations of the author, extending over a long period of time, it has been proved that it is the patient's cheapest investment and best insurance, being such a simple procedure, devoid of pain or distress, and frequently cuts short the distress and expense of other examinations.

It is always best, particularly so in doubtful cases, that the films of the urinary tract should be taken before the barium meals or enemas are given if fluoroscopy is intended. If the reverse procedure is practiced, renal and ureteral calculi are overshadowed by the barium.

X Ray and Radium in Urology. George Gilbert Smith, M. D., F. A. C. S., Boston M. & S. J., 192:335-340, February, 1925.

THE relation of radiation therapy to urology can best be appreciated after a summarization of the physics of the radiation elements. There are briefly two different forms of radiation—one involves the use of the beta rays,

the other involves the use of the gamma rays. The beta rays do not penetrate much more than one centimeter, but are extremely active in this limited area. On the other hand, the gamma rays are capable of penetrating even a foot of lead without being completely absorbed. However, the beta rays are eight times as active as the gamma rays in their limited field of activity. For this reason, the beta radiation is confined to surface growths, such as superficial epitheliomata, or tumors in which unscreened radium can be buried. The gamma rays are employed in the treatment of deep-lying tumors by enclosing the radiation within capsules of lead, platinum, silver or other metal thick enough to filter out the beta rays.

Since the gamma rays constitute only a small percentage of the radiation, much larger amounts must be employed. Usually 2000 to 4000 mc. hours are given at one exposure in the form of radium packs, or rays from the high voltage x ray machines are commonly substituted. The caustic action of the beta rays is so intense that all tissues, both normal and malignant, undergo complete necrosis when exposed for a comparatively short time. When deep radiation is employed, whether by the radium packs or the x ray, there is great difference in degree to which apparently similar tumors respond, and in the amount of reaction of the indivdual.

Tumors composed of the more immature or embryonal cells, such as the testicular tumors, are much more susceptible to the rays. Very cellular and rapidly growing tumors are also very susceptible to the rays. Certain German roentgenologists have formulated a theory of a "killing dose" for carcinoma and another for sarcoma. The former consists of a dose of approximately 90-110 per cent of the erythema dose. "Not infrequently," the author states, the "killing dose" for the carcinoma is the killing dose for the patient. Ewing believes that the roentgenologist cannot expect to kill a cancer by external radiation; it is necessary to employ the caustic action of the radium by exposing the tumor and implanting in it unscreened radium. Metastases can frequently be effectually destroyed by external radiation.

Ewing believes that the beneficial effects of deep radiation are due to interference with the circulation and blood supply. There is also a stimulation of the connective tissue and the formation of a protective barrier. Radiation in urology is employed only in cases of malignant disease, with one exception, fibrosis of the corpora cavernosa.

In the treatment of fibrosis of the corpora cavernosa of the penis, gamma radiation is used, so as not to cause superficial ulceration. Two or three needles of emanation, screened by 1 or 2 mm. silver, and 0.5 cm. gauze, are fastened to the penis by adhesive plaster in such a way as to subject the area of fibrosis to cross-fire. A total dosage of 200 mc. hours of radium is used and the treatments may be repeated every six weeks or two months.

In epitheliomata of the penis, frequent preliminary circumcision is necessary. If the growth is only involving the superficial structures of the glans penis, radiation is employed. The caustic effect of the beta rays is desired. Approximately 7-10 mc. hours of unscreened needles are applied over the affected area. This dose is best given by applying a fairly heavy dose for a few minutes, rather than a small dose for a longer period of time.

There is no question for the primary treatment of the tumor of the testicle. Orchidectomy should be done as soon as the dignosis is made. Metastases are early in this type of malignancy, so that complete dissection of the lymphatic glands is practically impossible. Deep radiation over the abdomen with the hope of devitalizing these metastases offers the greatest possiblity for the patient.

Adult kidney tumors have such a free circulation and are so bulky that nephrectomy followed by postoperative x ray treatments for the destruction of the metastases offers the only advisable treatment. Embryonic tumors of childhood yield more satisfactory results. To these, one-fourth erythema dose has been effectively administered.

Benign papillomata of the bladder yield well to fulguration through the cystoscope. Other growths so situated as to be removed by excision should be removed; but this arrangement constitutes a small percentage of the bladder tumors. As a rule, the fungating portion of the growth can be removed by cautery or diathermy and radium seeds or needles of small potency, may be implanted so as to bring excellent results.

Cancer of the prostate is divided by the author into operable or inoperable cases. Postoperative x ray radiation greatly diminishes the metastases in these operable cases. In the inoperable prostatic malignancies, x ray may be tried. Usually a course of treatments, consisting of four half erythema doses given on successive days, is recommended by the writer. The target distance is usually set at 80 centi-

meters, the kilometer voltage is 170, the filter is 0.5 millimeters copper and the current 3 milliamperes. Sacral and supra-pubic regions are exposed on alternate days. The standard erythema dose is placed at 1200 electrostatic-unit-seconds.

Phototherapy in Otorhinolaryngology. Abraham R. Hollender, M. D., and Maurice M. Cottle, M. D., J. Am. A. Med.-Phys. Research, 2:79-82, February, 1925.

THE beneficent effects of the sun's rays in nutritional diseases has long been recognized. But it was not until the work of Finsen with the carbon arc lamp, that the true bactericidal property of the blue, violet and ultra violet rays was realized. In otorhinolaryngology, phototherapy has been able to penetrate into the closed cavities and exert its germicidal and stimulating effect on the tissues.

The ultra violet rays are practically completely absorbed by the skin, while the violet rays penetrate more deeply. The ultra violet rays from the mercury quartz lamp have a superficial effect, the deep penetration depending on the distance of the lamp from the skin. The local effect in either case is considered bactericidal, and the general effect is looked upon as being biologic.

In treating chronic otorrhea, the ear is first cleansed out with suction, and an anilin dye, usually a 2 per cent mercurochrome solution is instilled into the ear canal and allowed to remain for a period of ten minutes, after which the ear is mopped dry and the lamp applied, with a suitable aural applicator, for one minute. The voltage is measured and the time is gradually increased until a three minute treatment is administered at the sixth application.

Phototherapy has proven beneficial in many other conditions, particularly the calcium deficiency diseases. Hyperesthetic rhinitis has been shown to be a calcium deficiency disease, and on this basis experiments were carried out to show the results with calcium, thyroid, parathyroid and combinations of these remedies. This calcium increase has been definitely increased by means of the ultra violet irradiations.

Phototherapy has also proved to be useful in external skin phenomena, for example furunculosis, acne, and dermatitis pustulosa. The effect of the ultra violet ray on the skin is not due to heat. The erythema which is produced is undoubtedly due to some photochemical reaction affecting the arterioles. Whether or not the amount of body reaction can be gauged by the degree of erythema produced is questionable. Pigment plays an important part in the skin irradiation and may be a factor in the absorption of the rays. Proceeding on this assumption, investigators have stated that favorable results derived are due in large part to the degree of pigmentation. If a local manifestation is present, ultra violet therapy will ameliorate the symptoms by augumenting the calcium content of the blood.

Bronchoscopy as an Aid to the Thoracic Surgeon. Chevalier Jackson, M. D., Sc. D.; Gabriel Tucker, M. D.; Louis H. Clerf, M. D.; Robert M. Lukens, M. D., and William F. Moore, M. D., J. A. M. A., 84:97-103, Jan. 10, 1925.

THE following conclusions refer only to bronchoscopy for disease, not for foreign body:

1. In dealing with pulmonary disease of other than aspirated foreign body origin, the bronchoscopist is merely an assistant to the internist and the surgeon.

2. The best results for the patient affected with pulmonary disease will accrue from close cooperation of the internist, the surgeon, the roentgenologist, the pathologist and the bronchoscopist. The internist can tap, look and listen on the outside; the roentgenologist can look through the patient; the bronchoscopist can look inside the living lung and bring up tissue and uncontaminated specimens of secretions for the pathologist, and, moreover, can render the normal and pathologic passages opaque for study by the roentgenologist. With such diagnostic means at his disposal, duly coordinated by the internist, the surgeon will have many otherwise impossible chances of cure of pulmonary superation and malignancy.

3. Pneumonography with bronchoscopically insufflated powdered bismuth subcarbonate is the greatest aid to the localization of pulmonary disease since the development of the science of roentgenology itself.

4. In most cases of lung superation in which external operation is deemed inadvisable, peroral bronschoscopic aspiration should be used weekly or oftener. Many cases have thus been cured and others improved; not one has been made worse.

The Effect of Bronchostenosis Upon the Roentgen Ray Shadows in Carcinoma of the Bron-

chus. Ross GOLDEN, M. D., Am. J. Roentgenol., 13:21-30, January, 1925.

THE core of the author's composition lies in the closing few paragraphs:

The object of this paper is to demonstrate the rather striking changes which may take place in the lung shadows during the course of the primary bronchial carcinoma. These are of interest because the impression produced on the mind of the observer may be quite different at different times of the disease.

A study of the presented cases suggests that, as far as its physical effect is concerned, bronchial carcinoma may be considered as developing in two stage: (1), stage of invasion, and (2), stage of bronchostenosis which is characterized by bronchiectasis, infection, atelectasis, and pleural thickening, with or without fluid.

The hazy ill-defined shadow about the hilus during the stage of invasion may be replaced, as the effects of bronchostenosis begin to manifest themselves, by a dense homogeneous shadow covering the area of one or more lobes, sometimes accompanied by displacement of the heart and trachea to the affected side. Such massive shadows are due to atelectasis of the corresponding lobes with associated bronchial and pleural changes and not to the tumor itself. Hence, it is evident that they are not characteristic of bronchial carcinoma but may be produced by a process which occludes a bronchus. Syphilitic stricture and pressure on a bronchus from an aneurysm or from tuberculous glands are other causes of bronchostenosis due to pulmonary neoplasm, only two from syphilis and none from pressure of an aneurysm or tuberculous glands. It would seem from our experience that neoplastic bronchostenosis is distinctly more common.

It is obvious that a correlation of clinical and laboratory information is necessary in order to reach a definite conclusion in these somewhat confusing cases. But when these shadows occupying the position of one or more lobes present themselves for consideration, if the possibility of bronchostenosis due to neoplasm is mentioned, the diagnostic machine will at least be started on the right road.

Study of 100 Cases of Empyema Treated by a Closed Method. HORACE BINNEY, M. D., F. A. C. S., Boston M. & S. J., 191:1206-1214, December, 1924.

IN the diagnosis of empyema, the symptoms and physical signs are usually sufficient; but the author considers it essential to corroborate the conclusions in every case with x ray pictures and exploratory tapping. Under the guidance of the x ray plate, the puncture may be more intelligently made than by the physical signs alone. The x ray also plays an important role in checking the inclosure of the cavity.

Roentgen Examinations in Pathological Fractures. Editorial. Radiol. Rev., 2:1, Jan.-Feb., 1925.

FRACTURES are divided into two general classes as to etiology: traumatic and pathological. Although the roentgen ray is of value in the diagnosis of all fractures, it is of particular value in the diagnosis of pathological fractures. In these cases, the x ray serves a double function and is indispensible, for in these conditions there is not only the radification of the diagnosis of fracture but often the pathological process can be determined.

The X Ray, the Best Insurance Against Mal-Practice in Fractures. HAROLD SWANBERG, B. Sc., M. D., Radiol. Rev., 2:11-13, Jan.-Feb., 1925.

IT is the contention of the author that all fracture and dislocation cases should have roentgenograms taken for two reasons: (1), in order that an accurate diagnosis and approximation may be obtained; (2), to act as a preventative for a mal-practice suit. It has been repeatedly established by the courts in recent years that the failure of the physician to have an x ray picture made in a fracture is considered evidence of negligence.

It was the Supreme Court of Minnesota that handed down the following decree: "Negligence in respect thereto (the proper setting of the broken ends of the tibia and fibula of the right leg of the patient) was charged against the defendant, particularly in that he took no roentgenograms to aid in the diagnosis of the fracture or in ascertaining its condition during the curative process." Again, the Court of Appeals of Kentucky decided as follows: "One could not read the record without being forced to the conclusion that the defendant was negligent in at least the one particular of not sooner making a roentgenogram of the elbow so as to enable him better to treat it thereafter."

Failure of the attending physician to have a roentgenogram made has formed the chief basis for many lawsuits. A physician must always be on his guard in the carrying out of his fracture work, and he should insist upon

a roentgenogram examination in every case in which the least doubt is present as to whether or not a fracture is present. Such a plan is the best possible insurance against a mal-practice suit in fracture work.

Osteomyelitis, Diagnosis and Treatment. J. Hutchings White, M. D., J. Oklahoma State M. A., 18:9-11, January, 1925.

IN the chronic form of osteomyelitis where there is oedema, redness and induration of the neighboring muscles, subcutaneous tissue and skin, the factors of diagnosis and treatment are very difficult. In such a condition, numerous discharging sinuses communicate with dead bone. These sinuses are lined with an unhealthy mass of granulation tissue called the pyogenic membrane. Before healing can be effected this membrane must be removed; but before removal can be accomplished the extent of involvement must be determined.

The roentgen ray is of much value in these chronic cases to determine the extent of involvement of the shaft, the progress of the new bone formation and the localization of the small abscesses.

The x ray is also of value in determining the procedure of treatment. When there is an entire destruction of the shaft and the limb is splinted with another bone, as in the lower extremity, the early removal of the necrosed bone is advocated while the periosteum is plastic. The time for this operation is variable, but the periosteum should have produced a thin layer of new bone. At this stage the x ray will show some decided thickening of the cortex. One is also aided by the x ray in determining the time for the removal of the necrosed bone—approximately when the total diameter of involucrum equals one-half the normal shaft, about twelve weeks after acute infection.

Roentgenological Aspects of Brain Tumors—Meningiomas. Merrill C. Sosman, M. D., and Tracy Jackson Putman, M. D., Am. J. Roentgenol., 13:1-12, January, 1925.

THE most common cerebral tumors causing characteristic local bony changes are the endotheliomas, or as the authors prefer to call them, meningiomas. These cerebral meningiomas represent about 12 per cent of all intracranial tumors.

Roentgenological findings are recorded from a group of 106 verified meningiomas and a classification given based on the point of origin of the tumors. There are marked roentgenological, clinical and pathological differences among the meningiomas in these various situations. They may be listed as:

1. Cranial-nerve-foraminal tumors.
2. Suprasellar tumors.
3. Tumors arising from the olfactory groove of the ethmoid.
4. Sphenoidal ridge tumors.
5. Sylvian cleft or temporofrontal tumors.
6. Tumors of the convexities.
7. Parasagittal tumors.
8. Meningiomas of the falx.
9. Tumors of the transverse and sigmoid sinuses.

The technique used varied with the case under observation, the type of apparatus employed, and the new accessories. Ordinarily a 4½ to 5 inch gap, fine focus tube, double screens, duplitized films and grid were used.

The bony changes which are considered characteristic by the authors are:

1. Erosion and vascularity.
2. Osteoma formation.
3. Spicule formation.
4. Diffuse thickening.
5. Enlargement of the meningeal channels.
6. Calcification.

These changes are most frequently and clearly seen in the meningiomas of the vault. Tumors about the sella are apt to cause a nonspecific distortion and destruction of the clinoids. Tumors of the base are often accompanied by a diffuse thickening of the floor of the skull. Those arising from the falx, from about the sella, or from the sinuses of the posterior fossa are least likely to give any indication of their presence.

In the differential diagnosis, syphilis is the first condition to be ruled out. These tumors present a more worm-eaten appearance, and are usually without vascular channels. The patient may always be checked by the Wasserman reaction and respond to antisyphilitic treatment. In osteomas, the differentiation is only made at operation. Osteogenic sarcoma present a distinct variation in the rate of growth but otherwise closely resemble meningiomas.

These tumors are considered by the authors as locally malignant, that is they invade muscle, bone and adjacent tissues, but do not metastasize to neighboring organs. For this and many other reasons, radiation has been attempted in the treatment of these conditions. "In a few of these, as well as a few in which the diagnosis was at first uncertain, radiation has been tried but with no encouraging re-

sults whatsoever.... In view of their low degree of malignancy and their enucleability, surgical removal may be highly successful."

Spasmophilia. JOHN T. THORNTON, M. D., West Virginia M. J., 20:11-18, January, 1925.

SPASMOPHILIA is a condition occurring in infancy and early childhood, characterized by increased irritability of the nervous system to mechanical and electrical stimuli, and manifested by local and general muscular spasm.

In addition to the clinical picture presented by the patient, there are certain physical examinations that may be used in the ascertaining of the involvement of the disease. One of these physical signs, known as Tiemich's sign, is a measurable increase in the electric irritability of the nervous system, which is a constant finding in all cases of spasmophilia. When a galvanic current is passed through a normal motor nerve, there occurs a contraction of those muscles supplied by this stimulated nerve. With a suitable apparatus it is possible to measure the minimal amount of current required to produce a contraction. In any case the measurement will vary according to the positive (anodal) or negative (cathodal) pole placed over the nerve and whether the contraction is caused by the stimulation from the make or break of the circuit. Using a negative pole placed over the nerve, and the stimulation arising as the result of opening the circuit, it has been found that the nerve of a healthy child under five years will not respond to a current of less than five milliamperes. However, a child in a spasmophilic state will demonstrate a muscular contraction with a current less than five milliamperes strength. Tiemich's sign is found in no convulsive condition other than spasmophilia.

Another condition is found in cases of spasmophilia—a definite diminution in the blood calcium. For this reason the ultra violet therapy has been of particular value in the treatment of these conditions. As a rule, the mercury vapor quartz light is used, the exposure being made at a distance of thirty inches, measuring from the tube to the surface of the nude child. The first exposure is administered to both the front and back for a period varying from a half to a minute. These exposures are made once daily and their duration gradually increased a half a minute at a time unless marked redness of the skin is encountered. In such a case, treatments are either omitted for a short time or the duration of the treatments are decreased. Occasionally the direct sun's rays are administered, at first to only the ankles and legs for a period of about fifteen minutes. The extent of the body exposed and the time of the exposure are gradually increased until the entire naked surface of the body is exposed for one hour or more.

The prophylactic treatment of spasmophilia might be briefed as maternal nursing, and plenty of unobstructed sun light.

Radiation Therapy of Malignant Disease. JAMES T. CASE, M. D., J. A. M. A., 84:108-114, Jan. 10, 1925.

IT is the opinion of the author that although radium and roentgen rays have shown themselves indispensible means of treating superficial malignancies, their value in deeper seated lesions is still held decidedly in question by important groups of scientific men. The best modern attack on malignancy consists in the complete removal when possible of the whole neoplasm at one operation, together with its lymphatics and the associated glands which form the route by which the cancer cells pass to other regions. This removal may be done with the knife, the cautery or electrocoagulation.

Whenever malignancy is treated by radium or the roentgen ray, in order to stem the tide of widespread skepticism that still exists regarding the value of roentgen ray and radium as an adjunct in the treatment of malignant disease, the author believes that it is of first importance to procure in every possible case a biopsy specimen for pathological study and further reference. In a comparative study of the results of surgery and radiology, one can accept only those cases in which a tissue diagnosis has been made. This pathological study is indirectly valuable in the treatment of the condition. Extirpation should be made at the growing edge of the tumor. It is the peripheral region beyond the outposts of visible or palpable disease that the radiologists should give special attention. A knowledge of the course along which the infection is apt to spread will enable the roentgenologist to treat with greater accuracy these tracts of probable disease extension.

After the determination of the indication for radiation treatment, the method of administration is the next problem to solve. Shall the radiation therapy be administered over a longer period of time, with frequent or long intervals between applications, or shall

it be given as an intensive therapeutic effort; and if the latter, shall it be given in the shortest time possible so that the total radiation in a case is administered within three or four days or less, or shall it be divided into smaller daily doses and the duration of the treatment protracted to ten or twelve days? The author answers these inquiries in the following manner: The first named method is pernicious and should be abandoned. The other two suggestions both really constitute intensive irradiation, in the one case given "brutally," and in the other given gently, but as a protracted intensive radiation. Regaud and his colleagues at the Radium Institute of Paris, used this latter method without greatly increasing the total dosage, and it is the procedure to which a large number of the radiologists of this country are gradually turning.

The author has been employing for deep therapy the water cooled high voltage roentgen ray tube designed to deliver satisfactorily as much as 50 milliamperes at 250,000 volts. This has resulted in a very gratifying reduction in the time of treatment (reduced to five to ten minutes instead of one to two hours), there is a marked diminution of the amount and severity of the radiation sickness. "Even with the increased intensity available by this tube, we still adhere to Regaud's plan of giving small doses (six to seven minutes) every day, but distributing the total dose over so long a period that the total time required to introduce an erythema dose into any deeply seated tumor is from eight to twelve days."

The dosage administered to the tissue radiated depends upon the condition of the tissue (cachectic persons bear radiotherapy poorly), the susceptibility of the individual, and the variation in the susceptibility of the various tissues both normal and abnormal. Special care must be exercised in radiating lesions about the neck, where damage to the larynx and trachea is apt to occur, and in radiating the lower abdomen and pelvis.

As to the efficacy of preoperative and postoperative irradiation, "I am convinced of the value of radiation as a postoperative prophylactic measure.... I believe in preoperative treatment. The patient is in a better state of health to stand massive doses than would be the case after operation. The surgeon runs less risk of spreading active cancer cells by the surgical trauma that he has to carry out provided anteoperative radiation has been given. In the light of our experimental knowledge that radiotherapy will cause atrophy with partial obliteration of the lymphatic channels, coupled with a deleterious action on tumor cells, and especially in the light of the work of Murphy at Rockefeller Institute, I cannot do otherwise than accept the conclusion that every case of known malignancy should first be submitted to a thorough intensive preoperative exposure of radiation. It is our custom to give the preoperative treatment either three or four weeks before the operation or within two days of the operation. The postoperative treatment is given just as soon as the patient is out of bed, unless the preoperative dose shows as an outward reaction."

End-Results of the Treatment of Cervical Carcinoma with Radium and Roentgen Rays. Henry Schmitz, M. D., J. A. M. A., 84:81-85, Jan. 10, 1925.

THE conclusions of the author adequately summarize the contents of the article:

Carcinomas of the uterine cervix must be grouped to facilitate the clinical study and the evaluation of radiation therapy.

The study of the incidence of the number of pregnancies justifies the conclusion that chronic infection constitutes the most important predisposing cause in cancer of the cervix, and that pregnancy probably plays a secondary role as a predisposing factor.

The five year end-results have been presented and compared with those of other clinics. The low operability in this series of cases is compared with the high operability in other clinics. Viewed from this angle, we conclude that the end-results obtained in our series compare favorably with the radiologic and surgical statistics. The end-results give radiation therapy of cervical cancers a definite place in the treatment of this disease, especially in the borderline and clearly inoperable groups.

Some Fundamental Considerations in Radium and X Ray Therapy. Charles D. Enfield, M. D., Amer. J. Surgery, 38:302-306, December, 1924.

IT is the contention of the author that there is no more occasion for the internist or the surgeon to familiarize himself with roentgen dosage factors, nor with the minutiae of treatment technique than it is for the radiologist to become familiar with the technique of the various surgical procedures. These purely technical phases are, and shall remain the exclusive sphere of one who is to apply these measures. *But*, if failure to understand the

broad general principles causes him to refer his cases at the wrong time; to fail to refer cases that could be markedly benefited; or to specify a particular sort of radiation therapy when another sort, or a combination would be more desirable, then it is the function—and the duty—of the radiologist to attempt to clarify the situation by helping those outside his specialty to a better understanding of the underlying principles of his work.

Unfortunately some radiologists become subordinated to a fanciful technique or machinery and the misfortunes that are sure to encompass these inexperienced and unqualified radiologists—working, however, with new and impressive equipment—are unreservedly used to characterize the entire practitioners of radiology and to reflect upon the sincere and careful and generally successful efforts of the thoroughly capable men operating with the same sort of physical equipment. Can one imagine such a situation arising in surgery? Would it be possible for an apprentice barber surgeon to retard general appreciation of the value of surgery in a community by his bungling efforts? Not now; but when surgery was as young as radiology now is, exactly this could, and no doubt did, occur. So there is a simple request made to these surgeons, "bear with us in this period of growth and development which surgery went through many years ago; discount our enthusiasm a little, but not too much, and remember that because some one had a disastrous radium or x ray result three or five years ago does not necessarily mean that that result represents today the maximum achievement of radiation therapeutics in this particular type of case."

The basis of radiation therapeutics is the varying susceptibility of different kinds of tissues to radiation effects. Among the normal tissues, lymphoid tissue is much more susceptible to radiation than muscle, skin and other types of tissues. Again, radiation is much more specific in its effects upon abnormal tissues than it is on normal tissues. These same specific differences in susceptibility, other types of radiation exist in regard to tumors. Such being the case, every tumor is a study within itself, and no uniform carcinoma or sarcoma dosage can ever be established.

As to the biological effect obtained by the administration of the various types of radiation therapy, it is important to note that radium and x ray exercise an almost identical effect upon the tissues—the observed differences in effect being due to the method of administration. To illustrate this point it might be noted that with the proper combination of filtration and distance, the radium effect is produced not only without destruction of tissue but with no appreciable inflammatory reaction whatever.

Using either radium or x ray, any one of three effects may be produced: (1), destruction of the area rayed; (2), sterilization without destruction, but the cells' vitality so impaired as to render them incapable of reproduction. This type of tissue effect is desired in preoperative radiation of the breast cancer, as well as in postoperative prophylactic radiation; (3), the vitality of the radiated cells so affected as to depress them, and the defense of the host stimulated.

The technique of production of these various effects depends upon the underlying physical principles of these two elements. Radium decays at an absolutely constant rate, producing as far as the radiologist is concerned, two types of rays: (1), the beta ray, which corresponds to the *soft* ray of the roentgen bulb; and (2), the gamma ray, or the *hard* roentgen ray. The activity of the radiation from either the x ray bulb or from radium decreases in intensity with the square of the distance from the source. It is also true that the action of these radiant elements depends largely upon the method of application, and the important factor of dosage must include time of application, distance, filtration, milliamperes and voltage.

It is reasonably apparent from this brief dissertation that "radiation therapeutics is not and never was the work of a technician; that it is a highly specialized field in medicine which, to achieve its possibilities, requires a personnel consisting of thoroughly trained physicians familiar not only with the detail of their own specialty but with most of what is important and new in internal medicine and surgery as well.

"It should be evident that the time will never come when x ray or radium dosage can be administered blindly, following set and routine methods with any respect of good results. Here, as in other fields of medicine, the patient is an individual, the disease presents certain individual and peculiar characteristics and treatment cannot be successfully standardized."

Value of X Rays and Radium in Treatment of Cancer. W. M. Sheridan, M. D., Radiol. Rev., 2:5-11, Jan.-Feb., 1925.

AFTER a brief historical sketch of the discovery and advancement of the roentgen ray and radium, the author considers the modern application of these two therapeutic measures. As to the relative value of these two elements, there is no definite basis for comparison. Radium gives off alpha, beta and gamma rays. X rays and gamma rays are similar. For this reason these radiant substances are used for different types of pathological conditions.

Discussing the value of preoperative and postoperative radiation, the author sums his viewpoint in the following manner: "If radiation is going to be successful, there will be a distinct improvement after the first intensive treatment. If such improvement does not occur, the lesion should be excised. Radiation will certainly lessen the danger of recurrence, even if it does not destroy the epithelioma.... About 100,000 people in the United States die from cancer each year. Unless we check this death rate about one million people will die of cancer in the next ten years.... I believe that if all the knowledge that is now available concerning cancer were put into practical use, we could check this death rate at least 50 per cent. To accomplish this result, it is necessary to instruct patients to come early and to make a diagnosis as soon as possible and to make patient's chance of recovery doubly sure, by properly combining surgery and radiation."

Fluoroscopy in Medical Diagnosis. R. C. FINDLAY, M. M., New Orleans M. & S. J., 77:315-317, February, 1925.

FLUOROSCOPY is such a simple, direct procedure and so illuminating and instructive in its correct administration that it has become an integral part of the laboratory procedures for establishing a diagnosis.

Esophageal examination necessitates screen examination. By the barium-agar meal the various pathological possibilities may be eliminated: spasms at the cardia, contractures from scarring and malignancy, pressure from external causes as aneurysm, malignancy and inflammation, and diverticulae.

The roentgenographic examination of the stomach is one of the most important diagnostic measures in modern medicine. By this method, cancer, which usually occurs near the pylorus, may be observed and differentiated from ulcer which usually occurs on the lesser curvature or about the middle of the stomach. The essential difference of the two is that the ulcer shows a loss of tissue and the cancer shows a gain. In either case, peristalsis may or may not be increased or decreased. Syphilis or linitis plastica are the next most frequent lesions. Tuberculosis is a very rare condition in this area. Benign tumors also occur in this region but their differentiation from the malignant tumors cannot be made.

In the small intestine, duodenal ulcer is the most frequent lesion and is to be differentiated from pylorospasm, by means of belladona, and adhesions to neighboring structures, as the gall bladder.

To examine the colon, an opaque enema is given. By this method, malignancies are clearly shown by a filling defect or by obstruction. Tuberculosis may produce a similar picture and is to be especially noted in the examination of the cecum. Tuberculosis of the intestine is, however, generally a secondary manifestation of a primary disease. Ulcerative colitis shows spasm and occasionally the crater of the ulcer may be revealed. Spasticity may occur in any colitis. Diverticulae are occasionally shown by the barium pockets.

Fluoroscopy of the lungs is used to demonstrate accurately tumor, abscess or effusion. In like manner, tuberculosis of the lung may also be seen, but these lesions are best located with the films.

The heart and aorta may be easily studied by the fluoroscope. Cardiac hypertrophy, displacement by diaphragmatic, lung or tumor encroachments, widening of the aortic shadow in aortitis and aneurysm, may all be shown with the patient standing in front of the fluoroscope. Lymphosarcoma, Hodgkin's glands, tuberculous glands, and carcinoma often confuse the examiner and are often difficultly differentiated from cardiac or vascular pathology. Pericardial effusion, apex enlargement to the left in aortic insufficiency with the auricular enlargement and intervening insusura, total increase in the silhouette especially to the right in mitral disease, are conditions recognized by all observers. The fluoroscope has established for itself an unquestionable position in diagnostic medicine.

Air Cooled Ultra Violet Light Therapy. A. J. PACINI, M. D., New Orleans M. & S. J., 77: 317-319, February, 1925.

THE erythema developed following the exposure to the ultra violet ray depends upon: the intensity of the ultra violet energy given off by the tube, the distance separating the skin from the tube, the susceptibility of the patient's skin (varying with age, sex, en-

docrine type, and part of the body exposed), and the time of exposure. As a rule, a pronounced actinic erythema should not be sought. A slight reddening is stimulative; a more intense reddening is regenerative. Excessive reddening is invariably accompanied by vesication, and is superficially destructive. Three degrees of erythema may be designated: stimulative, regenerative and destructive.

Erythema, produced by the ultra violet ray, persists for from eight to twelve hours, and then assumes a bronze tint. Due to this bronze pigmentation, each ultra violet exposure after the first, given on the same surface, must be proportionally increased in time to compensate for the tolerance established by the pigmentation. However, if the ulcerated surfaces are being treated to stimulate epithelial covering, each subsequent ultra violet exposure must not be increased, but in all probability must be decreased inasmuch as the newly formed granulations are too young to withstand the previous radiations.

After exposure to the ultra violet rays, the blood will be found to have increased in calcium, phosphorus and in iron content. This increase in the blood calcium has established this mode of therapy, particularly in the blood calcium deficiency diseases. It has been observed that calcium salts stimulate the phagocytic effects of the leukocytes, and reduces anaphylactic reactions, as in hay fever, asthma, and hyperesthetic rhinitis. This was clearly shown by A. R. Hollander and M. H. Cottle in the February number of this Journal, 6:41, 1925.

It is the further contention of the author that angioneurotic edema, chronic urticaria, some cases of eczema, psoriasis, and seborrheic dermatitis are dispelled promtly by ultra violet irradiation, probably through the correction of the calcium deficiency.

It has also been shown that a marked decrease in the blood calcium exists in protracted jaundice. Under ultra violet, the toxic, mental and nervous symptoms are expelled.

It has been definitely proven that bone, joint and glandular tuberculosis are immensely benefitted by ultra violet radiation. Similar beneficial results have been reported in tuberculous peritonitis, osteomalacia, and demineralization of bone incident to disease or disuse.

Due to the increase in the iron content, the anemias in children, chlorosis, and secondary anemias of adults respond to the ultra violet rays.

"For reasons that are not clear, ultra violet radiation has been found to do good in these conditions:

1. "*Internal medicine*—Dysentery, influenza, disease of the liver, diseases of the glands of internal secretion, chronic peritonitis, mucous colitis.

2. "*Surgery*—The treatment of infected wounds.

3. "*Gynecology*—Amenorrhea, menorrhagia, dysmenorrhea, ovarian disease.

4. "*Skin*—Furunculosis, herpes zoster, urticaria, lupus vulgaris, scrofuloderma, acne vulgaris, pruritis."

Sunlight and Health. C. W. Saleby, M. D., G. P. Putman Sons & Co., New York.

(Continued)

CHAPTER VIII.

LIGHT AND COLD: A CANADIAN LESSON.

THE great, now outstanding, causes of death, which we shall conquer next, are URBAN, HIBERNAL, and RESPIRATORY. Without here making any more than passing reference to pneumonia and bronchitis among adults, I may merely note that, during the past twelve years (ever since the hot, dry, diarrhoeal summer of 1911) the highest point of the annual curve of infant mortality has been during no longer the third, but the first trimester; and, further, that our efforts for infant welfare have accomplished nothing worth mentioning against the mortality during those months, whilst they have been most gloriously successful against the mortality during the summer. It being granted, that our winters are deadly, we must next identify the factor or factors which make them so.

"Cold is an enemy of the semi-starved,
It is a stimulating friend of the well-fed."

CHAPTER IX

Never again should a case of rickets occur anywhere. It is time to make an end of the "English Disease," which can certainly be prevented, or cured, without money and without price, by means of a preventive, or a medicine, which is everywhere available, which is nobody's patent or monopoly, which no doctor is needed to prescribe, nor chemist to dispense, nor parent, no ratepayer, nor cheerful giver to pay for.

Dr. Palm in 1890 urged the following:

1. The establishment of means for having systematic and exact records of the sunshine in the heart of our great cities as well as at favorite health resorts. A sunshine recorder at an observatory on some hilltop near a large

city is no guide to the amount of sunshine that reaches the streets and alleys of smoky cities. It is important that the sunshine recorder be of the form which indicates the chemical activity of the sun's rays rather than its heat.

2. The removal of rachitic children as early as possible from large towns to a locality where sunshine abounds and the air is dry and bracing.

3. The establishment of a sanatorium for poor rickety children in some such locality, where the severe development of the disease may be averted and much life and health saved by timely treatment.

4. The systematic use of sun baths as a preventive and therapeutic measure in rickets and other diseases.

5. That, when a mother has once borne a child which has become rachitic, preventive treatment of the disease in her future children should be adopted, if possible, by change of climate and mode of life in the mother, nothing urged above being inconsistent with the belief that the mother's state of health brought about by the same causes predisposes her offspring to rickets.

6. The education of the public to the appreciation of sunshine as a means of health. Many persons seem to prefer darkness to light in their dwellings out of ignorance, thoughtlessness, or even an economic regard for carpets and curtains. Let people understand that sunshine in the dwelling not only reveals unsuspected dirt, but is Nature's universal disinfectant as well as a stimulant and tonic. Such knowledge will also stimulate efforts for the abatement of smoke and for the multiplication of open spaces, especially as playgrounds for the children of the poor.

CHAPTER X

Incomparably the best way to treat a patient suffering from rickets or tuberculosis, or any of the other diseases of darkness, is by heliotherapy. The ill person, blanched and devitalized by light starvation, and the specific disease which has now complicated it, is gradually, slowly, cautiously restored to the light for lack of which he is dying.

The most tragic accidents have occurred, and there will be many more. The curative agent is the light, and not the heat, of the sun. In varying proportions, they reach us together; but the light stimulates, whilst the heat innervates. There have been those who, never having seen heliotherapy in practice, nor having read a line by any of its students, have begun by exposing the chests of patients suffering from pulmonary tuberculosis to the midday sun, and have then concluded from the consequent fever, spitting of blood, and early end of the case that sunlight is useless in pulmonary tuberculosis. I totally repudiate responsibility for any accident or disagreeable event, great or small, that may follow attempts at heliotherapy without sense, caution, and study. The whole thing depends upon the healing power of nature; it is a vital reaction on the part of the patient's body to certain modes of stimulation and nutrition available in the sun's rays. It, therefore, partakes of the subtility, variety, and spontaneity of life; each case is to be regarded as personal and unique, and all statements about times and seasons and dosages are to be regarded as mere average indications of the kind of thing that would apply in many instances.

The real meaning of heliotherapy is that we should restore to our urban lives the sunlight by which all life is maintained, and that, therefore, we should abolish the plague cloud of coal smoke which deprives us, during the winters, of more than half of our sunlight—and especially of those lowering notes in the ultra violet which are probably the most valuable of all that the sun sends us.

CHAPTER XI

Ever since the discovery of the tubercle bacillus in 1881, we have been hypnotized by our one-eyed staring at it through the microscope, and have called it THE cause of tuberculosis without remembering that no infection can occur without susceptibility, and that the capacity to be infected is as much a necessary factor of tuberculosis or any other infection as is the infective agent itself. The evidence of war and the after war in Vienna and elsewhere has recently caused medical opinion everywhere to open both eyes, forget the tubercle bacillus for a moment, and look around at the conditions of nutrition, or malnutrition, which cause us either to be consumers of the tubercle bacillus, if it enters us, or to be consumed by it. A new era in the study of nutrition dates from the German and American experiments on sunlight, and begins to explain, or to construct a key for the explanation of, the incomparable success of sunlight against tuberculosis.

As if to link sunlight and milk, these two agents of normal nutrition and vital resistance, even more closely than we have already shown, Hess and his fellow-workers have made a series of observations which mean, in effect, that milk of perfect composition can be produced

only by cows which are properly sunlight and fed on green leaves—which are themselves the product of sunlight. Evidently there is here a lesson for the nursing mother and those who care for her, as well as for all who are concerned in the production and use of milk. It may be that, in view of the new American work we must recognize two vitamins, similar in some respects but distinct, which have hitherto been subsumed under the term vitamin A. It remains to be seen what are the relations between vitamin A and vitamin A 1; but in any case the experimental record is to the effect that when young animals are fed exclusively on the milk produced by cows fed in the shade and on a vitamin free fodder, it does not suffice for their needs; they lose weight and die. On the other hand, similar animals fed on similar quantities of milk of cows fed on pasture (which involves the action of sunlight both on the cows and on the green leaves they consume), grow and thrive. In the first experiment along these lines, which we are quoting, vitamin C appears to have been chiefly concerned, but doubtless the same general principle is involved in the other cases. Not vitamins alone are concerned. "Passing over minor variations," say our authors, "it is seen that the percentages of calcium and of phosphorus were significantly higher in the pasture milk, and that its citric acid content was over 50 per cent greater."

CHAPTER XIV

The knife and the bottle have their uses, but the cult of the knife and the bottle has degraded the healing art, until there is no beautiful and subtle structure in our bodies but the surgeon itches to remove it, whilst we bestow the lovely name of spring medicine upon various chemical aperients, and forget the real spring medicine, the blessed sun which arises with healing in its wings.

At Columbia University and the Home for Hebrew Infants in New York—which I revisited in December, 1922, in order to see this work at first hand—it has been found, for the first time in the history of science, that the sunlight controls the chemistry of the blood. Continuous observations, begun in 1921, have shown that on a constant diet the quantity of phosphorus in the blood of an infant or young child is at a minimum in March, begins to go up in April, rises until July, and then slowly but steadily descends until March again. Observations begun a little later show the same curve for the calcium of the blood. It has long been known that the amount of calcium and iron in the blood increases when one lives in the mountains; and I have always, therefore, refrained from accepting the statement that the Alpine sun-cure enriches the blood in iron, thanks to the light alone, until we had more evidence; but it has now been proved that light, as such, apart from any mountains, adds to the iron in the blood. In the urban laboratories of New York, at no altitude, and in ordinary stagnant urban air, the action of light has been shown even to double the phosphorus content of an infant's blood in a fortnight, on an unchanged diet.

It has also been shown that, in certain instances, poisons which would be fatal in their action during the darker months of the year, are resisted in the late spring and summer. A famous skin specialist, with whom I was lately discussing some proposals for the increased use of sunlight, told me, to my delight, that when any of his juniors was proposing a new treatment for an intractable chronic skin disease—known as LUPUS ERYTHEMOTOSUS—he told them to be sure to begin the new treatment in the spring, and then they would get good results!

Lastly, it has been shown that the thyroid gland in the neck, the use of which, we know will cure idiocy, due to lack of it, is richer in its unique iodine-containing secretion in the summer than in the winter. We thus have the definitely proved beginnings of a seasonal chemistry of the sunlight, and upon this the new medicine will be based.

Now observe the use of calcium and phosphorus in bone building, not the annual curve of those elements in babies' blood; and consider the discovery that, in New York—a smokeless city which has mild cases of rickets in the light-starved slums of its lower east side—no new cases of rickets occur in summer, and the largest number of new cases begin in March.

Doubtless the reader asks how to use sun baths, as well he may. I do not regard this question as of the first importance, for the essential things to do are to abolish our coal smoke and our slums, to equip our houses and factories accordingly, and to live more in the open air, without the usual preposterous excess of skin covering, and thus to get our sun baths, at work and at play and in the ordinary course of our lives, whilst we are thinking of something else.

But it is a very proper thing to think of the health of others, and there is much need for systematic use of sun baths in the treat-

ment of rickety children, and very notably, in the prevention of tuberculosis, and in the care of convalescence from whatever disease.

The thing sounds simple and "fool-proof." It is nothing of the sort. The worst accidents have followed the exposure of consumptives to midday sun, in the belief that that is "heliotherapy." I preface these remarks by an explicit warning. The sunlight is a powerful agent, and like other powerful things, is dangerous and may be destructive if misapplied. The heat of the sun (beyond a certain low point, of course), is innervating, destroys appetite, promotes fever, devitalizes.

If it were merely a matter of heat we could cure consumption or rickets or debility or anaemia by sitting indoors and "frosting" over the fire. It is possible to have "too much of a good thing." We must drink water, but we should soon die if we drank it continuously. We need sunlight, but the blessed calm and peace of the night, to which, as creatures evolved upon a revolving world, we are exquisitely adapted for sleep, reminds us that we do not need the sun perpetually.

We must protect the eyes and the head from fatigue and sunstroke.

Light, food, water, hay, even love itself—these boons do nothing for us except in so far as we respond to them. Response is individual and personal. Each child or adult must be treated as unique; "the proof of the pudding is in the eating." The principles are:

1. To "hasten slowly," beginning with only a few minutes, gradually increased.

2. To use those sacred early morning hours which "summer time" in part restores to us, invaluable because they irradiate and invigorate us with more light than heat.

3. To watch and go by the gradual tanning or pigmentation of the skin, a vital reaction, as yet not understood, which constantly goes with good results.

4. To expose the outlying parts of the body, arms, and legs, rather than, and before, the trunk.

ALL SUCH RESULTS AS INFLAMED SKIN, LOSS OF APPETITE, FEVER, WEARINESS, HEADACHE, SLEEPLESSNESS, ARE HIGHLY OBJECTIONABLE, and constitute condemnation of the method employed in the case in question.

The truth is that the sun-cure is not a simple, obvious, easy method which any one can apply to anybody, as too many people suppose. More accidents yet will happen, and many disappointments, until those concerned are prepared to read the one authorative and comprehensive volume in our language, or at least, to learn from those who have visited the clinics of Dr. Rollier and spent day after day in watching the true sun-cure applied.

Every case, even that of a well child or adult whom one wishes to benefit by the sunlight, and much more the case of a sick person, must be watched and guided by *the way in which it responds* to the light. That response is everything. Without it the light can do no more than it could for a corpse.

The sun-cure person begins to turn brown. This pigmentation of the skin is very important. We do not understand it, and we are now studying it in many new and special ways. The patient who pigments deeply and quickly is the patient who quickly profits by the light and recovers. If people freckle only, they must hasten more slowly than ever. Red haired people are often refractory in this fashion, and we must be patient with them. With time and care they will usually brown nicely and evenly, and all will go well.

The head must be protected and the eyes be shaded by a linen hat or otherwise. Sunstroke and eye strain may easily follow neglect of these simple precautions, which have nevertheless been often neglected.

Since the heat of the sun innervates, depresses, exhausts, burns, and otherwise does exactly the opposite of all we desire, we must use those hours of the day which give us the light rather than the heat. Here is new and most impressive evidence in favor of the principle of daylight saving.

"Baths of water are good, baths of air are better, baths of light are best." That is a saying of the French students, and we know it to be true, by sheer exact proof in the research laboratories in New York and Vienna and elsewhere.

The beach is incomparable. It gives the child everything.

The evident danger points are two, the head and the eyes. If we could really get our children to go to the beach soon after dawn, and obtain their unique value from those early morning hours, bright and cool, which are only a rumor for most of us, there would be little need to warn parents that THE HEAT OF THE SUN, beyond a very low point, is not our friend.

But I cannot say, with any hope of being followed, "Get up really early, for the best of the day, 'so sweet, so cool and bright,' and 'fear no more the heat of the sun'." What I

must say is that a loose, light, perforated, white, soft, linen hat—or cap with a brim all around, if that describes it better—is the proper headgear for children under the July sun.

Remember dosage and the "golden mean." It is possible to have too much of a good thing; a baby may even have too much of its mother's arms.

The common sense of paddling is that the child on the beach is right in wanting to paddle, thus getting baths of water and air and light, in some degree. Sir Henry Gauvain obtains excellent results from having the children at Hayling Island, suffering from tuberculosis, go paddling and bathing in the sea. (Those who cannot walk can be carried in and dipped.)

Bathing is better than paddling, and a child can scarcely be too young to learn to swim. As ever, the response of life to what is offered it is everything. Some one has blundered, something is wrong if the child on the beach has a headache or cannot eat or cannot sleep. But if we do not blunder we shall see for ourselves what Nature can do when her children respect and try to understand her.

Here, in order of increasing importance, are certain tasks which, I think, in view of our new discoveries, devolve upon the women of Great Britain, because the men alone have proved quite incapable of discharging them:

1. Within reasonable limits, curtains and blinds and shutters must be drastically restricted, except for use at night. WE HAVE ENOUGH SUNLIGHT IN ENGLAND, BUT ONLY IF WE VALUE AND USE IT. Do we prefer to see a good color in our carpets or in our children's cheeks? To some extent we must choose, but to that extent the choice cannot be in doubt. It is time to end the folly of spending time and money in the purchase of pills and capsules and liquid chemicals, rich in iron, lime and phosphorus, and dosing our children with them, in the shade, now that we have learned how sunlight dominates the chemistry of the blood, and how, on the simplest and most inexpensive diet of natural foods, the blood will contain all the precious things it needs, given sunlight.

We must include window glass with blinds and shutters, for it is opaque, most unfortunately, to the most powerfully vital rays that the sun sends us—the ultra violet or "chemical" rays.

2. WE MUST NOT ALLOW FASHION TO DOMINATE OUR CLOTHING, OR OURSELVES, OR OUR CHILDREN. We must aim at health, which is a first condition of beauty, and beauty is always fashionable, except in the eyes of fools, "by whom to be dispraised were no small praise." Short of entirely denuding our limbs, we can choose materials which allow some valuable light to pass through. I obtained in Columbia University last year samples of an inexpensive mercerized cotton, one black and the other white, in the same material. Through the former, light will not cure rickets; through the latter it will. These researches have only just been begun. They tend towards more liberal and innocent ideas of the human body, and its clothing, than our grandmothers might have approved, and away from a kind of prudery which was a poor substitute for nice-minded modesty.

3. Women have to make homes of life out of the houses of brick, built by men. New houses are to be built. Women should effectively demand, through their representatives, that in these new houses, smokeless equipment shall be provided.

Also, it needs the women of the country, as trustees of its children, to counteract the influence of the big manufacturers who are now telling the Government that industry will be ruined unless factory chimneys are to smoke as ever. Essen, Cologne, Dusseldorf, Zurich, New York (for instance) are smokeless. If our manufacturers cannot conduct their business without destroying the people, they should yield to others who can. Meanwhile, by their "works" we shall know them.

L. C. Donnelly, M. D.,
Detroit, Michigan.

(To be continued)